INDIA RUBBER WORLD

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OUR 64th YEAR

A BILL BROTHERS PUBLICATION

JULY, 1953

Canada's First Oil Furnace Carbon Black Plant
CABOT Carbon of Canada, Ltd.
SARNIA, ONTARIO
CABOT
Officially opened on June 26, 1953

for balanced properties

NEOPRENE Type WRT

The new all-purpose neoprene

Here are the advantages you'll get with Neoprene Type WRT:

IN YOUR PLANT Look at Neoprene Type WRT from the standpoint of processing. It handles well on the mill, acting in much the same fashion as Type W. In storage, too, Type WRT is very stable and doesn't undergo changes characteristic of other general-purpose neoprenes. Furthermore, Type WRT resists stiffening in the uncured state. Stocks retain tack; building operations proceed smoothly.

IN YOUR PRODUCT Neoprene Type WRT has excellent set over a wide range of temperatures. At -50°F., it is better than any of the other neoprenes or natural rubber. At 300°F., set is still outstanding. Type WRT compounds are also remarkably free from crystallization in the cured state.

To these plus values, add oil and chemical resistance, resistance to sunlight and weathering, resistance to ozone and oxidation, and excellent aging—characteristics for which the neoprenes are so well known. You'll agree that Neoprene Type WRT *is* an all-purpose polymer.

Why not prove to yourself that Neoprene Type WRT can give you special benefits in your plant—in your product? We'll be glad to send samples. For more complete information, consult Report No. 52-1. If you'd like another copy, call your Du Pont representative or write E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Div., Wilmington 98, Delaware.

WRITE OR PHONE OUR NEAREST DISTRICT OFFICE FOR FURTHER INFORMATION.

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BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

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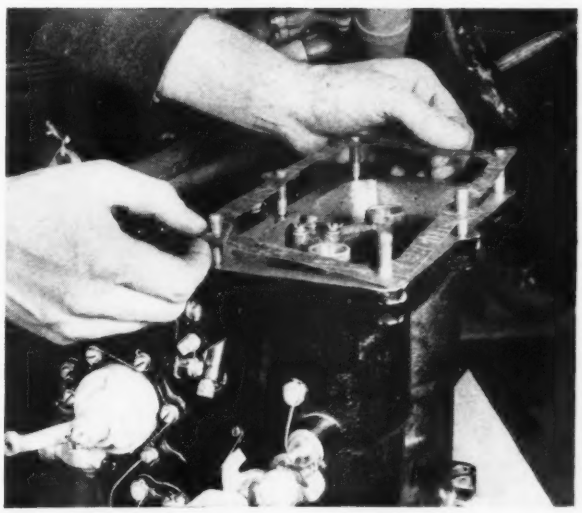
More developments using

B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Company does not make these products. We supply the Hycar rubber only.

On Aircraft, Oil Well and Electrical Jobs

. . . versatile Hycar scores high!

LOOK at the three typical uses of Hycar pictured. They show the wide range of applications for this versatile American rubber. And they also show how Hycar helps improve products and operations —save money.

The carburetor gasket is used on a Navy helicopter. Hycar bonds the asbestos fibers of the gasket, helps seal power *in*—keep trouble *out*. Hycar resists heat, oil, solvents and retains its high tensile strength. It helps make the gasket non-absorbing, non-swelling and non-cracking.

The Hycar rubber "O" ring seal is one of many uses for Hycar in the petroleum industry. It's used on a powerful pump designed for jet bit, big hole and deep drilling. The Hycar "O" ring seals tightly, resists abrasion and the hydrocarbons entrained in the drilling fluid.

On the volt-ammeter, the trigger is made with a Hycar rubber-phenolic compound. Breakage under sudden pressure which used to plague rag-filled phenolic triggers has been reduced almost to zero.

Hycar's many advantages may be the perfect answer to your product improvement or development problems—and your sales plans. We'll help you select a Hycar rubber compound exactly suited to your needs. For technical information, please write Dept. HA-7, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
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Hycar
Reg. U. S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

For rubber products that are better Choose the proper **Philblack*** *letter!*

EASY For easy mixing, fast processing, use Philblack A. Smooth tubing—accurate molding—brilliant finish, too.

TOUGH For a rubber that's *tough*, use Philblack O, the HAF black with a record for long, durable life plus good electrical conductivity.

RIGHT For high abrasion applications at moderate cost, use Philblack I—our new ISAF (Intermediate Super Abrasion Furnace) black.

SUPER There's nothing like Philblack E for super strength, super wearing ability! That's how Philblack E won its title . . . SAF!

The Philblacks are famous for supplying qualities you need in *your* rubber products. Consult our technical sales representative, or write our nearest office.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

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* A Trademark

The Philblacks are manufactured at Borger, Texas. Warehouses in Akron, Boston, Chicago, and Trenton. West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

Aranox prevents it!

If **heat and oxygen** are taking the toughness out of *your* Neoprene coated fabrics, you'd better try Aranox.

This semi-nondiscoloring antioxidant stabilizes cured Neoprene at high temperatures against breakdown and release of chlorine—thus preventing the tenderizing of cotton fabrics frictioned or skimmed with Neoprene stocks.

Aged 7 weeks at 212°F, a sample 1" wide strip of frictioned cotton fabric *without* Aranox failed with no pull at all, while a similar strip *with* Aranox withstood a pull of 92 lbs. per inch!

Aranox also gives excellent protection with minimum discoloration in natural rubber stocks for white or light-colored molded goods and sundries. And it protects against copper and other pro-oxidant metals—especially important in a wire insulation compound.

It is especially recommended for Neoprene coatings, high temperature wire insulation, air cured sheeting, and sulfur chloride cured stocks.

A gray powder in form, Aranox has good storage stability, requires no handling precautions, and disperses readily. Find out more about Aranox® by sending the coupon below today.

Naugatuck Chemical

Division of **UNITED STATES RUBBER COMPANY** • Naugatuck, Conn.

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Naugatuck Chemical, 137 Elm Street, Naugatuck, Conn.
Please send Compounding Research Report No. 17, on Aranox, to:

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85% Insoluble Sulphur

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POWER FACTOR A FACTOR?

PLIOLITE S-6B gives you better, lower-cost wire insulation

EXTENSIVE TESTS prove PLIOLITE S-6B has greater electrical resistance than other reinforcing resins.

EXTENSIVE USE proves PLIOLITE S-6B gives better, easier-made insulation at lower cost.

PLIOLITE S-6B gives you better insulation because of its higher electrical resistance (see chart) and the improved properties it gives natural and synthetic rubbers. This high styrene-butadiene copolymer reinforces rubber – makes jacket stocks longer and stronger–improves appearance, age life and abrasion resistance. It also imparts resistance to water absorption and to oils, greases and chemicals. It makes possible the production of exactly centered, thin-walled insulation of uniform wall thickness.

PLIOLITE S-6B gives you lower-cost insulation because of its low specific gravity, its faster, easier processing and its tolerance of higher loading. It disperses more rapidly and more thoroughly than other reinforcing resins – reduces the "nerve" of rubber for faster, smoother, more exact extrusions – permits extension with inexpensive fillers without sacrifice of properties.

If you want wire or cable insulation of higher quality at lower pound-volume cost, use PLIOLITE S-6B. Free literature, technical assistance and samples are yours by writing to:

Goodyear, Chemical Division, Akron 16, Ohio.

ELECTRICAL DATA — PLIOLITE S-6B vs. OTHER RESINS

DIELECTRIC CONSTANT		FREQUENCY USED		
RESINS TESTED		1000 cycles	1×10^6 cycles	10×10^6 cycles
PLIOLITE S-6B	Dry	2.57	2.53	2.52
	Wet	–	2.58	2.60
RESIN "A"	Dry	2.62	2.54	2.52
	Wet	–	2.59	2.61
RESIN "B"	Dry	2.61	2.58	2.60
	Wet	–	2.68	2.70
POWER FACTOR				
PLIOLITE S-6B	Dry	0.00029	0.00025	0.0021
	Wet	–	0.00048	0.0025
RESIN "A"	Dry	0.00042	0.00029	0.0018
	Wet	–	0.00190	0.0064
RESIN "B"	Dry	0.00054	0.00057	0.0015
	Wet	–	0.00170	0.0060

CHEMICAL GOODYEAR DIVISION

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THE GOODYEAR TELEVISION PLAYHOUSE
every other Sunday—NBC TV Network

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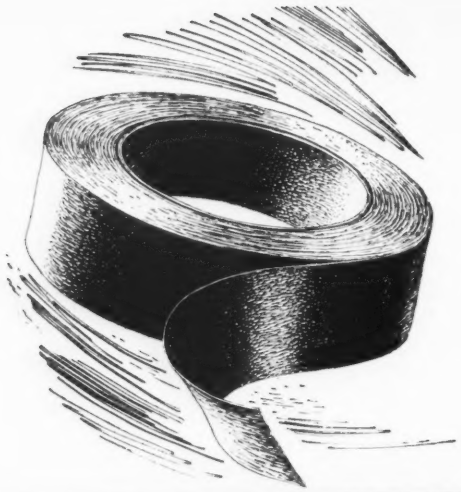
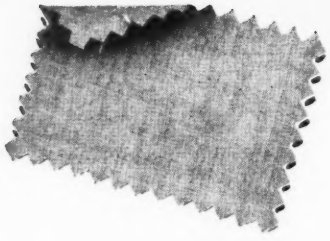


If it's got to have CONSTANTLY UNIFORM QUALITY...



make it Wellington Sears "Columbus Sheeting"—a superior fabric for rubberizing

One of the most versatile industrial fabrics in the entire Wellington Sears line, Columbus sheeting has long been outstanding for its constantly uniform quality. Yard after yard, this lighter weight fabric is an absolute minimizer of headaches in production and inspection.

Columbus sheetings are made 40 to 120 inches wide in weights from 2 to 5 ounces per square yard. Whether it's for rubberized mechanical goods such as friction tape and cable wrappings, or for such rubber-coated products as hospital sheeting and service raincoats, or any use demanding high quality throughout, you'll find Columbus sheeting a versatile performer for your needs.

Additional Wellington Sears fabrics for coating, specialties and mechanical rubber goods are listed at right. Your nearest Wellington Sears sales office will supply you with full information on your rubber-and-fabric requirements.

An illustrated 24-page booklet filled with valuable facts on fabric development and applications of interest to present and potential users of industrial fabrics is yours for the asking. Write for a free copy of "Modern Textiles for Industry" to Wellington Sears Co., Dept. K5, 65 Worth Street, New York 13.

Superior Fabrics for the Rubber Industry

- Belting duck
- Hose duck
- Enameling duck
- Army duck
- Single and plied-yarn chafers
- Sheeting
- Airplane cloth
- Balloon cloth
- Nylon, high-tenacity rayon, other synthetics and combinations.

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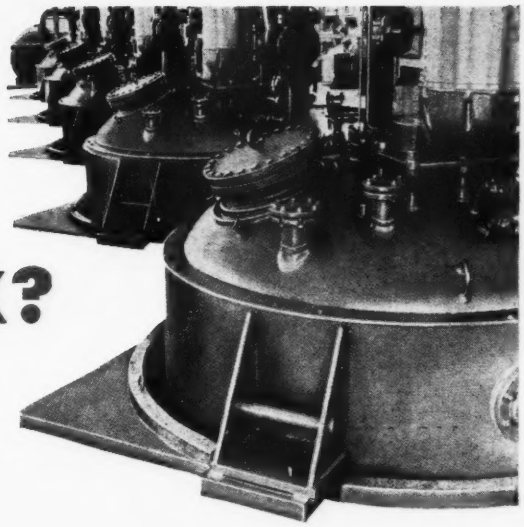
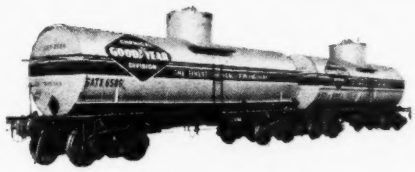


Looking for LATEX?

for coating
for saturating
for bonding

then, look to GOODYEAR



GOODYEAR produces a number of synthetic latices – latices developed through knowing research–latices made to the highest standard of quality and uniformity – latices backed by years of experience in the production of resins and rubbers.

Goodyear manufactures nitrile latices, styrene copolymer latices and vinyl latices. These are available in a range of monomer ratios, solids contents and types of stabilization to give you a wide choice in physical properties and processing characteristics. They also are mutually compatible for even greater versatility and application.

Goodyear latices have many uses in many industries. You'll find them in paints, coatings, finishes, impregnants, saturants, sizings and adhesives in the rubber, plastics, packaging, paint, paper and textile fields.

And, with Goodyear latices you'll find SERVICE –full technical assistance, ample sampling, efficient handling and delivery according to schedule. For synthetic latices as you want them–when you want them–look to Goodyear. For full information, write to:

Goodyear, Chemical Division, Akron 16, Ohio

LOOK AT THESE LATICES

NITRILE TYPE:

Chemigum Latices–"200" Series

Butadiene-acrylonitrile copolymers

Medium to high nitrile content

High solids content

Three types of stabilization

STYRENE COPOLYMER TYPE:

Chemigum Latices–"100" Series

Butadiene-styrene copolymers
Medium styrene content
High solids content

Pliolite Latices–"100" Series

Butadiene-styrene copolymers
High styrene content
Medium solids content

VINYL TYPE:

Pliovic Latices–"300" Series

Vinyl copolymers
High vinyl content
High solids content

CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Pliovic–T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

We think you'll like
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WHITER, BRIGHTER BEAUTY IN *Vinyl*

White upholstery, even white floor coverings, once symbols of fabulous luxury, become work-a-day beauties in vinyl. Washable and long-lasting, vinyl materials are finding wide use in the decorating field today.

Maximum whitening, brightening and opacifying effects per pound of pigment used are achieved with TITANOX-RA (rutile titanium dioxide). In addition, the uniformity of whiteness and light tints, so important to these products, is assured through your choice of TITANOX-RA as the white pigment.

Consult our Technical Service Department for friendly cooperation on problems in the white pigmentation of natural and synthetic polymers. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Atlanta; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

1682

TITANOX

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

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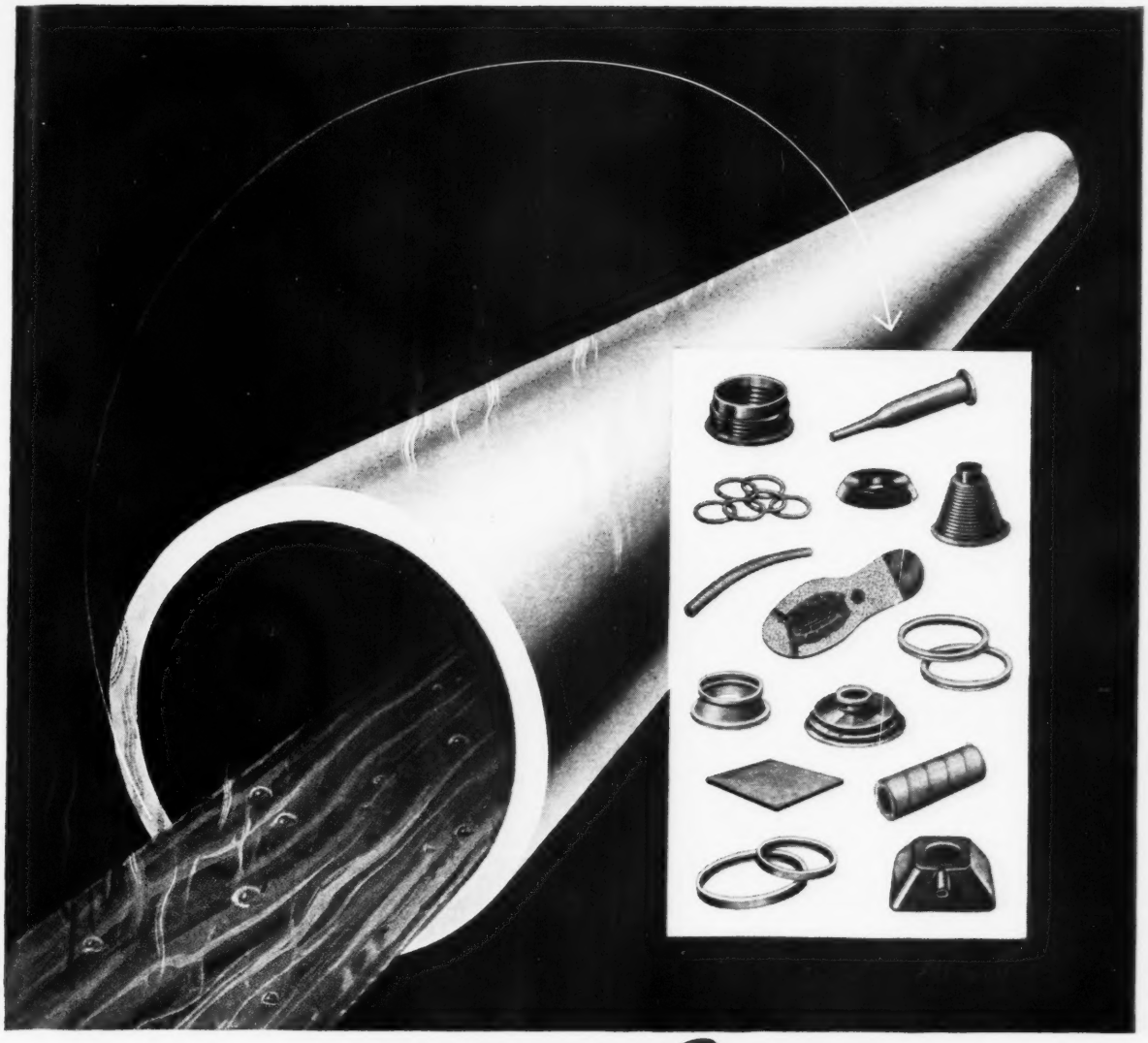

And now . . . heat-resistant *Paracril* pipe!

Yes, now this unusual oil-resistant chemical rubber makes hard-rubber pipe that excels many plastic materials for high temperature performance!

Economical pipe of Paracril® resists heat distortion at temperatures up to 275°F.! It's unharmed by oils, gasoline, aliphatic hydrocarbons such as hexane and hexene, solvents like ether, benzene, carbon tetrachloride, ethyl acetate, and benzaldehyde, and most other chemical agents.

What's more, this Paracril-made pipe has good impact strength—excellent dielectrical properties—and tensile strength as high as 7,500 psi!

Superior hard-rubber pipe is the latest of *many* products made finer with Paracril. In seals, gaskets, proofed goods, flooring, fuel and oil hose, "O" rings, military boots, and hundreds of other applications, Paracril offers a combination of properties that is unique.

Paracril is available in three general grades of oil resistance. It can be extruded, calendered, or molded by standard techniques—blended with other rubbers or plastics—used wherever a rubber-like material is needed.

If you're not already familiar with the many advantages Paracril offers you, better send the coupon below.

NOTE: Naugatuck Chemical makes and supplies Paracril only, not the finished pipe.

Naugatuck Chemical

Division of United States Rubber Company
NAUGATUCK, CONNECTICUT

IN CANADA: NAUGATUCK CHEMICALS DIVISION, Dominion Rubber Company, Limited, Elmira, Ontario • Rubber Chemicals • Aromatics • Synthetic Rubber • Plastics Agricultural Chemicals • Reclaimed Rubber • Latices

Naugatuck Chemical, 137 Elm Street, Naugatuck, Conn.

Please send Paracril Technical Bulletin #1 to:

Name_____

Title_____

Company_____

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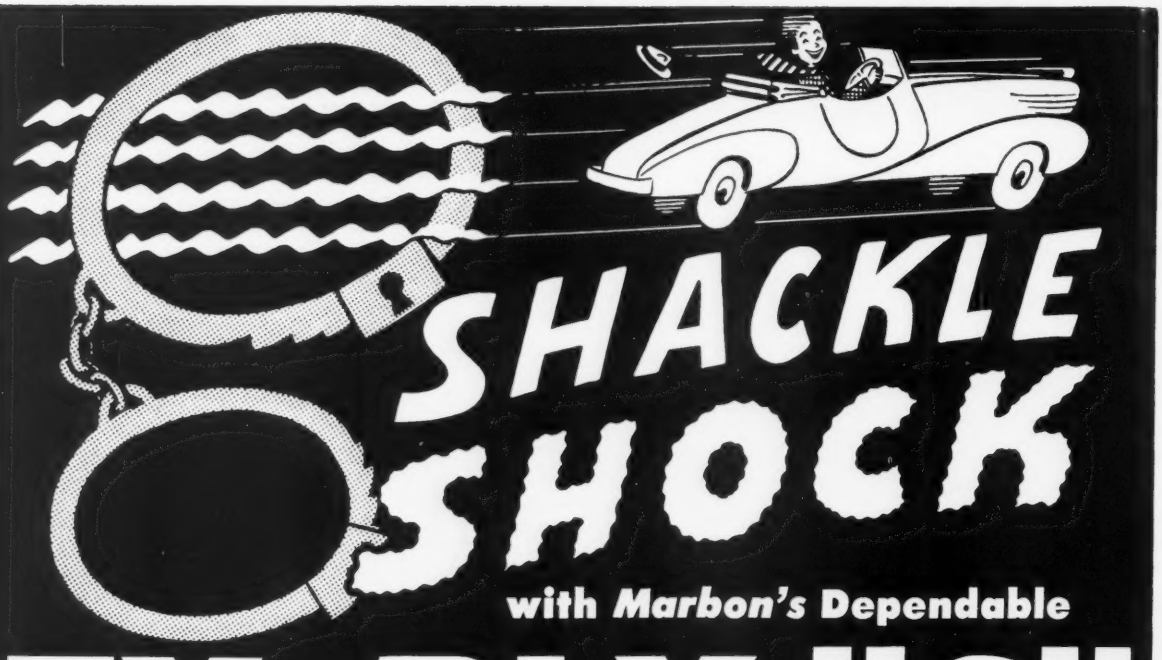


SHACKLE SHOCK

with *Marbon's* Dependable

TY·PLY "S"

THE VERSATILE, CONSISTENT ADHESIVE FOR BONDING NEOPRENE

TY-PLY "S" is ideal for bonding Neoprene compounds of all types in static and dynamic uses — tension, shear and compression; such as motor mounts, diaphragms, industrial rolls, seals and shock absorbers.

TY-PLY "S" resistance to acid, alkali, salts and alcohols makes it especially effective as a bonding agent for Neoprene in tank and pipe linings, ventilating ducts, industrial pumps, etc.

TY-PLY **Q** or **3640** for bonding Natural, GR-S, and Butyl

TY-PLY **BN** for bonding N-types

TY-PLY will adhere most vulcanizable rubber compounds to almost any clean metal surface

Marbon

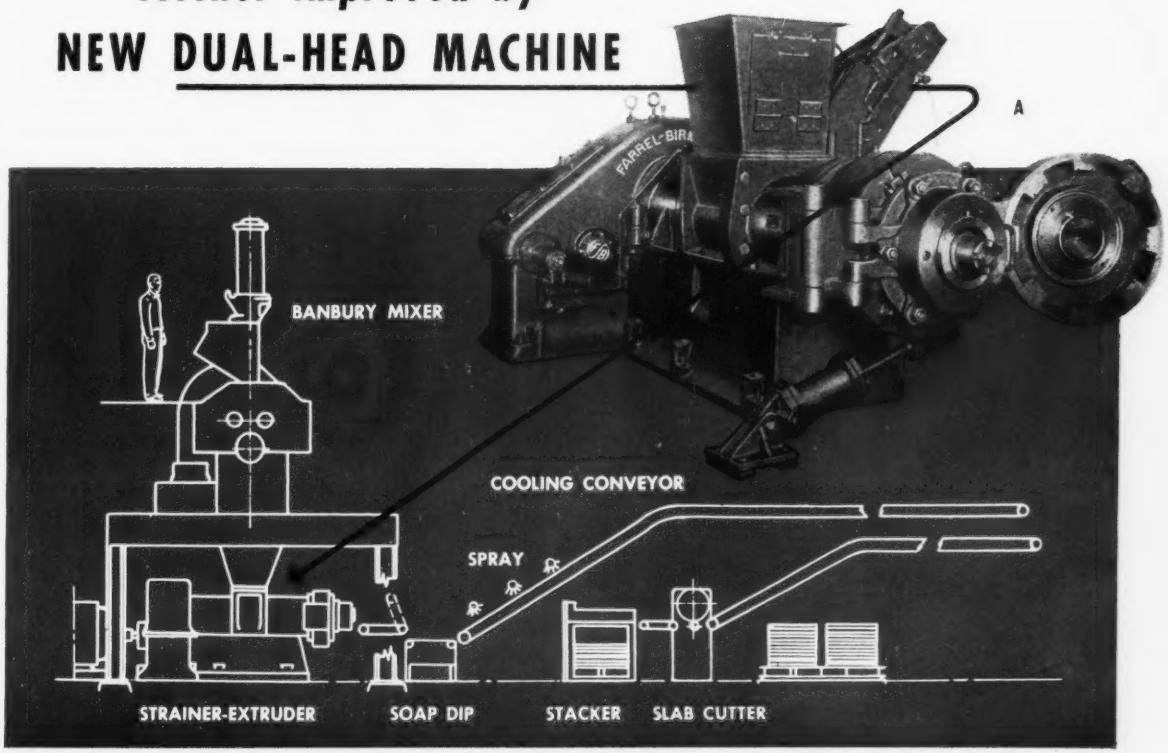
MARBON CORP.

GARY, INDIANA

SUBSIDIARY OF BORG-WARNER

TY-PLY has stood the test of time . . . since '39

STRAINER-EXTRUDER SYSTEM
further improved by
NEW DUAL-HEAD MACHINE



Three years ago, Farrel-Birmingham announced the development of the strainer-extruder system shown in the above diagram. Now, with a new dual-head machine available as optional equipment, the system becomes even more versatile and efficient.

In this system, the combination strainer-extruder takes the Banbury batch (either direct from the mixer or by conveyor), strains it or extrudes it, or both. With a cooling conveyor incorporating a dip unit, slab cutter and stacker, material from the Banbury* mixer is automatically strained, extruded, soaped and stacked in neat piles.

The two or three men required by a conventional system are no longer needed. The Banbury operator controls the entire process. Not a pound of stock is lifted or carried manually.

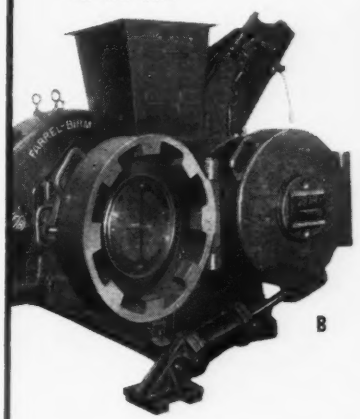
The new strainer-extruder has two hinged heads of breechlock construction which are hydraulically operated to make change-over easier. One head is for straining and has a circular die to deliver the stock in a tube which is slit at the die exit to form a continuous slab of the stock. The second head extrudes the stock as a flat strip, without straining.

Farrel-Birmingham extruders are built, either with or without strainers, in sizes to handle the output of any production size Banbury mixer. These machines, although similar in general features, are specially designed to suit your exact requirements.

Send for further information about extruders to meet your exact needs, or for complete details of the Farrel-Birmingham strainer-extruder system.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston FB-828

A (Above) New Dual-head strainer-extruder with combination straining and circular die extruding head in position. Stock is strained and then extruded in a tube, which is slit at the die exit.



B Here the strainer head has been swung out of the way, and the flat strip extruder head placed in position.

Farrel-Birmingham®

*Trade mark of Farrel-Birmingham Co., Inc.

found at last....

a **non-staining** antioxidant

STABILITE WHITE*

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

STABILITE WHITE is a mobile liquid NON STAINING antioxidant showing maximum age-resisting properties. It combines ease of handling and processing, sun-light and flex-check resistance and at the same time possesses the ultimate in non-staining characteristics. When these properties can be obtained with no increase in compounding costs, the far-seeing compounder will convert his recipes to include **STABILITE WHITE**. Try it in ***your*** compounds — crude rubber, synthetic or natural latex.

*MANUFACTURED BY CHEMICO, INC.
THE C. P. HALL CO. *Manufacturing Agents*

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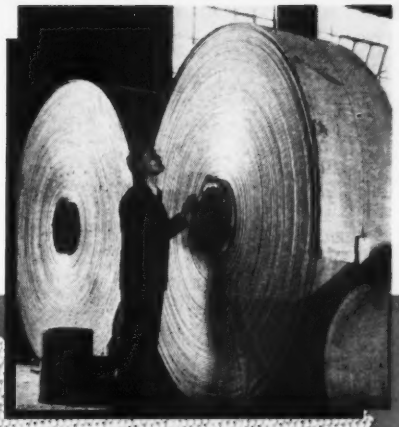
UNIFORMITY

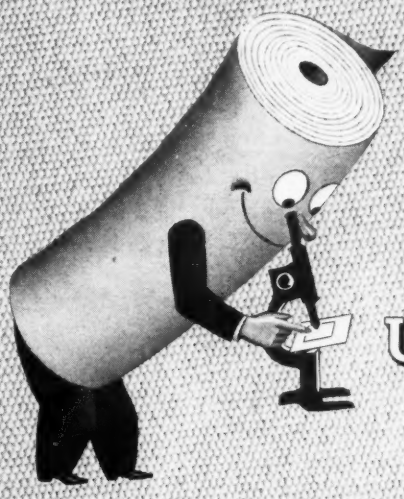
Makes The Big Difference

In INDUSTRIAL FABRICS



MT. VERNON FABRICS

GIVE YOU GREATER UNIFORMITY



One of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here yarn number is being determined with Suter Scales.

FABRICS ENGINEERED TO FIT YOUR NEEDS

Need adaptation of an existing fabric to your special purposes? Or creation of an entirely NEW fabric —cotton, synthetic or blend — to meet your specifications? Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

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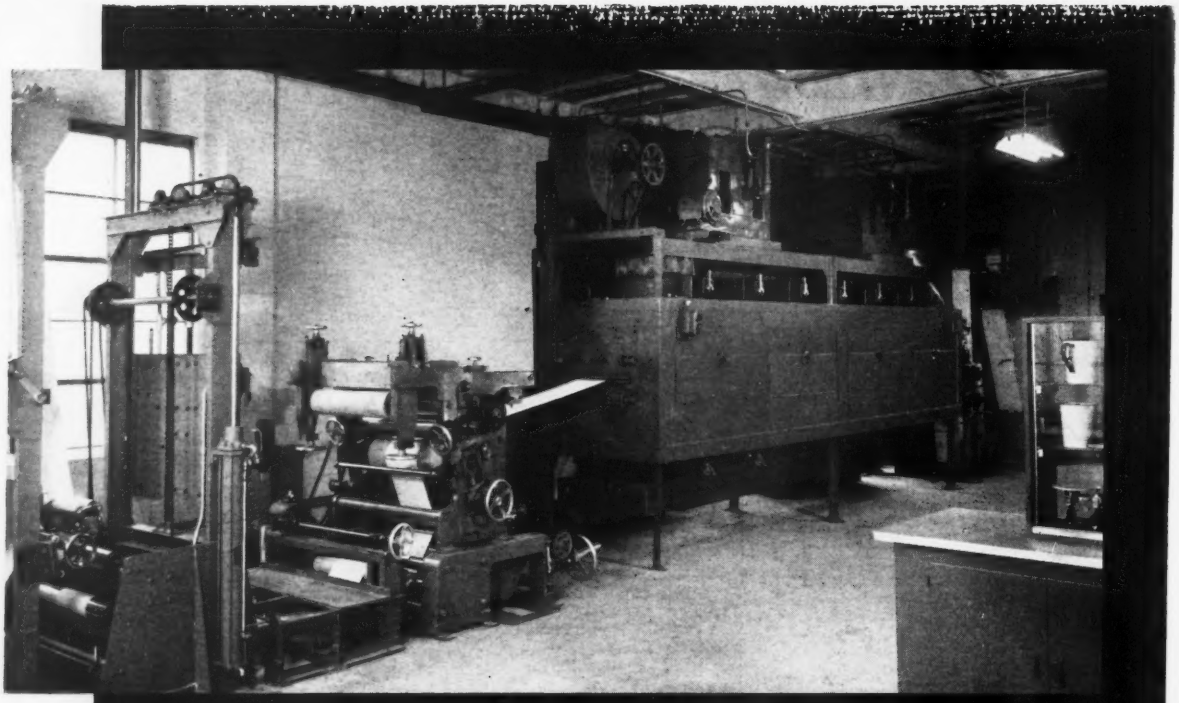


IOI ENGINEERING VERSATILITY

COMPLETE PILOT PLANT UNIT *for coating and impregnating webs up to 24" wide*

THIS PILOT PLANT UNIT is designed for complete processing of fabrics, papers, films and foils up to 24-inch widths, using various coating or impregnating methods and materials. It includes a complete coating unit, web-handling system and evaporator, dryer and fuser.

The coating unit comprises all the necessary equipment for complete continuous coating of any web material under controlled conditions as to time, temperature, tension, coating thickness, embossing pressure and process speeds. The coating machine head, itself, is arranged for: 1) Knife Coating, 2) Reverse Roll Coating, 3) Impregnation and Doctor Blade Removal, 4) Impregnation and Squeeze. It will handle and coat plastisols, hydrasols, organosols, rubber cements, lacquers, paints, water proofing, fire retardants, etc. Its viscosity handling range extends from water thin solutions to heavy plastisols and rubber compounds.

The web handling system provides: 1) continuous feed roll or J-box feed, 2) automatic web pretensioning, 3) adjustable continuous width expanding for fabrics, 4) reverse roll surface coating, or knife coating, or saturating dipping at constant web tension and web speed, 5) electronic coating thickness control, 6) solvent evaporating and final fusing, 7) low pressure embossing —coarse or fine pattern, 8) water cooling of web, 9) continuous edge aligning, 10) continuous takeup at constant tension and variable speed, 11) variable web speeds from 2 YPM to 32 YPM (web speeds *above or below* this basic range can be provided in the ranges of 1:1, 1:2, 1:3, or 1:4), 12) dynamometer tension readings, 13) differential stretch control system.

The evaporator, dryer and fuser provide: 1) dual zone heating with precise individual control, 2) two side heating of the web, 3) temperature range in each zone extending from 100°F. to 650°F., 4) constant tension or stretch control during drying, 5) variable zone length in either zone, 6) variable air volumes and velocities on each zone.

This entire pilot plant unit is available now, completely assembled and ready for demonstration runs. For demonstration appointment or further information, write:

INDUSTRIAL IOI ENGINEERING VERSATILITY **OVENS, INC.**

13825 TRISKETT ROAD CLEVELAND 11, OHIO

GEN—TAC*

The Proven Vinyl Pyridine Latex Makes the Difference

WITH GEN-TAC

WITHOUT GEN-TAC

The adhesion of the stock to the cord is greater than the strength of the stock.

The carcass stock has separated from the cord because of low adhesion.

GTR
GENERAL TIRE & RUBBER
Chemical Products

TRY IT IN YOUR OWN TIRES WITH YOUR OWN STOCKS

CHEMICAL DIVISION
THE GENERAL TIRE & RUBBER COMPANY

AKRON, OHIO

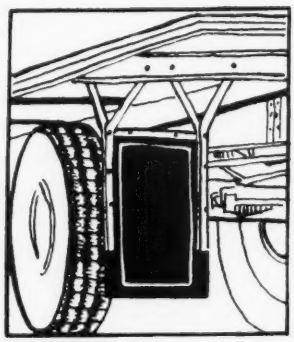
*Trade Mark

FOR TRUCK

SPLASH GUARDS

USE

Pequanoc MOCCASIN



Truck splash guards take a real "beating." That's why many rubber manufacturers use Pequanoc **Moccasin** Reclaim in their splash guard compounds. Here's a typical formula with costs and physical characteristics:

Moccasin Reclaim	62.60
Mineral Rubber	9.40
Zinc Oxide	.85
Soft Clay	5.80
FEF Black	15.10
Antioxidant	.35
MBTS	.50
DOTG	.25
Plasticizing Oil	4.30
Sulfur	.85
	100.00

Est. Lb. Cost	$.0835
Sp. Grav.	1.32
Vol. Cost	$.1102
Tensile	750-800 p.s.i.
Elong.	225-250%
"A" Durometer	78

•

We'll gladly send you a test sample of **Moccasin.** Write for it today.

Pequanoc Rubber Co.

MANUFACTURERS OF RECLAIMED RUBBER

MAIN SALES OFFICE and FACTORY: BUTLER, N. J.

To Serve The South!

AIR VIEW OF MEMPHIS
Memphis Chamber of Commerce

United Carbon Company, Inc., announces the opening of a branch office in Memphis, Tennessee. This step was made in order to give the greatest service to the growing rubber industry in the southland. This office is located in Suite 2907-08, Sterick Building.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

NEW YORK • AKRON • CHICAGO • BOSTON • MEMPHIS

CANADA: CANADIAN INDUSTRIES, LIMITED

To Serve The South!

AIR VIEW OF MEMPHIS
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UNITED CARBON COMPANY, INC.

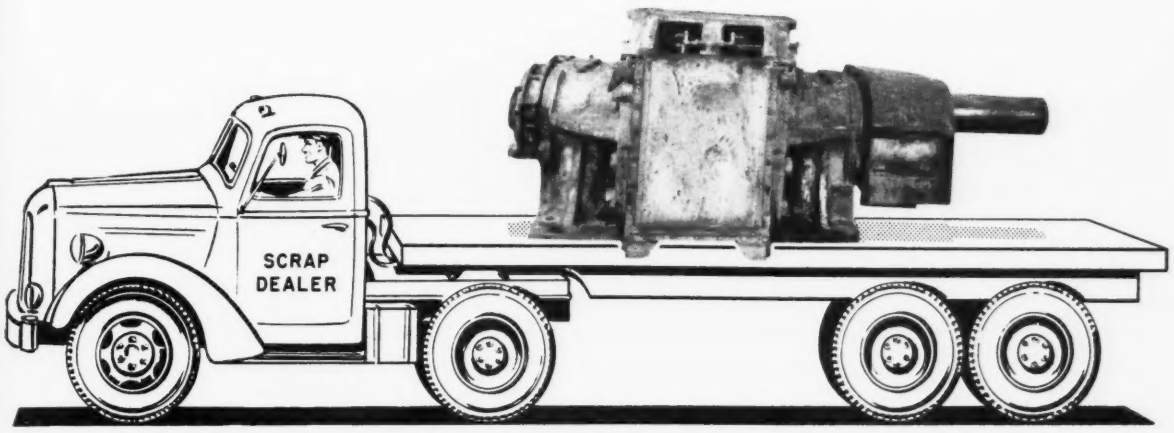
CHARLESTON 27, W. VA.

NEW YORK • AKRON • CHICAGO • BOSTON • MEMPHIS

CANADA: CANADIAN INDUSTRIES, LIMITED

WAIT

Don't junk that Banbury* body



Farrel-Birmingham can give it new life

When severe service and abrasive wear make repairs necessary to your Banbury* mixer, ask Farrel-Birmingham to rebuild it for you.

This service includes the restoring of all worn parts to their original size, contour and efficiency. New parts are substituted only for those old ones which are broken or too badly worn for successful repair.

When the repair work is completed, your rebuilt Banbury body will be just as good as a new one, and will carry the same guarantee.

You can rely on Farrel-Birmingham for your Banbury mixer repairs and rebuilding. As the sole manufacturer of the machine for thirty-six years, the company has the unequalled experience, facilities and know-how to return a worn machine to its original work capacity. It is the only company having the necessary drawings, jigs, fixtures and gauges for satisfactory repairs.

For the best in Banbury mixer repair work, write, wire or telephone one of the offices listed below.

FREE INSPECTION SERVICE

A complete and competent inspection service, by factory-trained mechanics, is available to all users of Banbury mixers in the United States. A request will bring an inspector to your plant, promptly and without cost to you. He will examine your machines thoroughly, report to you on their condition, and recommend any work that may be necessary to put them into first-class shape.

FARREL-BIRMINGHAM COMPANY, INC.

ANSONIA, CONN. (Telephone Ansonia 4-3331)
AKRON, OHIO, 2710 First National Tower (Tel. Jefferson 3149)
CHICAGO, ILLINOIS, 120 So. La Salle Street (Tel. Andover 3-6434)
LOS ANGELES, CALIF., 2032 Santa Fe Avenue (Tel. Lafayette 3017)
HOUSTON, TEXAS, 860-A M & M Building (Tel. Preston 4472)

FB-832

*Trade-Mark

Farrel-Birmingham®

Such confidence must be deserved!

Skellysolve for Rubber and Related Industries

Applications

SKELLYSOLVE B. For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound. Closed cup flash point about −20°F.

SKELLYSOLVE C. For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve B. Closed cup flash point about 13°F.

SKELLYSOLVE D. For cements and variety of manufacturing operations. Good odor. Quick drying. Minimum of heavy, greasy compounds. Closed cup flash point about 3°F.

SKELLYSOLVE H. For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve D is desired. Closed cup flash point about −20°F.

SKELLYSOLVE V. For use wherever a relatively slow drying solvent is desired. Closed cup flash point about 50°F.

SKELLYSOLVE R. For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency. Closed cup flash point about −25°F.

"DOC" MacGEE SAYS: Rubber product manufacturers who use Skellysolve have one thing in common—an implicit feeling of confidence with regard to their source of solvent supply. And with good reason! From the pioneering days of over 20 years ago right up to the present, Skellysolve customers have had but precious little to worry about their supply of solvents.

Quality-wise you can put your confidence in Skellysolve. It's always uniform. Every batch has the same over-all properties you need to protect the quality of your product. You can bank on Skellysolve's low end points, quick evaporation, low vapor pressure, and its minimum of unsaturates as well as pyrogenic decomposition products. There's a minimum of both low and high boiling compounds . . . to reduce rejects caused by blushing and blisters.

Controlled vapor pressure guards against bloated containers. Low boiling compounds are kept at the barest minimum to prevent "seeds" in rubber cements; high bonding strength is assured by freedom from greasy residues.

Quantity-wise you can count on Skellysolve. Your supply is supported by a network of strategically located refineries, bulk plants and the "will-to-do." And we offer alternate methods of delivery to cope with any emergency.

Want help on special solvent problems? Call on our Skellysolve Technical Fieldman.

SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY
KANSAS CITY, MISSOURI

CONTROL

Dials and recorders keep automatic check on temperatures and pressures throughout General Atlas plants – to guarantee the same pellet perfection, exceptional performance from every shipment of Pelletex.

Control Laboratories at points of manufacture constantly evaluate Pelletex throughout every step of production, maintaining further control of the production process. A central Referee Laboratory, examining periodic production samples, assures uniform testing.

Fully equipped Cabot rubber laboratories test Pelletex rubber compounds on various types of modern testing apparatus.

GENERAL ATLAS DIVISION
of Cabot Carbon Company

GODFREY L. CABOT, INC.
77 Franklin Street
Boston 10, Mass.

CABOT

PELLETEX

Looking for a Zinc Oxide free of AGGREGATES?

Do you want . . .

- a zinc oxide without aggregates?
- a zinc oxide with the particles insulated from each other by a special coating that promotes excellent dispersion in rubber?
- a zinc oxide of higher apparent density that increases Banbury capacity?

*TRY PROTOX-166**

- It is free of aggregates.
- It is made by a patented process that disperses aggregates.
- Its individual particles are coated with zinc propionate— an outstanding dispersing agent.
- It mixes fast
  —cuts mixing costs
- It disperses well
  —provides high efficiency of zinc oxide
  —gives more freedom from tear centers

These are some of the reasons why Protox-166 is one of the most widely used grades of zinc oxide in the rubber industry. If you have not yet tried Protox-166, discover its advantages in your compounds by running a trial lot.

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

. . . most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

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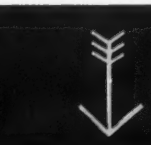
Useful for: Paints – Adhesives – Cements – Anti-Rust Compounds – Floor Tile – Textiles Waterproofings – and many other products



PICCOUMARON

Para-Coumarone-Indene Resins

Available in ten melting points from a liquid to tough, brittle solids. Brief descriptions of principal properties are given below. Complete data and samples will be gladly sent upon request.

SOLUBILITY

All grades are soluble in coal tar solvents, turpentine, terpene solvents, most ketones, most chlorinated solvents and derivatives, and esters. Most grades are soluble in drying and semi-drying oils.

COLORS

Colors vary from light (Coal Tar Resin Color Scale numbers 1½ to 3½) through medium, reddish, dark to extra dark (numbers 12-16).

GRADES

Standard grades include ten melting points and six colors. Special grades are made for users where requirements are large enough to make special runs economical.

WEIGHTS

PICCOUMARON Resins vary in weight according to the melting point, averaging 8.5 to 9.2 pounds per gallon.

CHEMICAL PROPERTIES

Have good acid resistance, being inert to all except concentrated oxidizing acids; good alkali resistance; do not react with most pigments. Composition is essentially para-coumarone-indene polymer.

PLASTICIZERS

Suitable plasticizers include: most of the chemical or ester types; most of the aromatic hydrocarbon types; most heat-bodied oils; cottonseed pitches; soft petroleum residues.

COMPATIBILITIES

The compatibility of various grades of PICCOUMARON RESINS has been determined for waxes, resins, petroleum and coal tar residues, pitches, pine tar, paint and varnish oils, rubber and rubber-like materials, chlorinated and other materials.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.

CLAIRTON, PENNSYLVANIA

Plants at Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

Distributed by

Harwick Standard Chemical Co., Akron 5, Ohio

"National security is impossible without financial security of individual citizens..."

FRED MAYTAG
The Maytag Company

"Ingenious research and the ability to produce . . . which have helped to make the United States the world's greatest nation . . . could not have been realized without the savings of millions of thrifty persons. Savings of individuals financed new inventions, developed others. The Payroll Savings Plan for purchasing Savings Bonds regularly provides an easier way for American workers to save for future spending or investment, for their own security, and for their nation's security. Our experience at the Maytag Company has shown us that a successful Payroll Savings program can be the foundation and the cornerstone of happy employee relations."

Let's point up Mr. Maytag's concise summary of the Payroll Savings Plan with a few very recent figures:

• at the close of February, 1953, the *cash value* of Series E Bonds held by *individuals* reached a new high: $35.5 billion. This is $1 billion more than the value of the Bonds held on May 1, 1951, when E Bonds began to mature.

• to this encouraging reservoir of future purchasing power, 8,000,000 Payroll Savers are adding $160,000,000 per month by their consistent investment in U.S. Savings Bonds.

• unit sales of E Bonds in 1952 reached the highest level of the past six years—more than 77 million individual pieces. Of the 77 million units, 67 million were in the $25 and $50 denominations—the bonds bought chiefly by Payroll Savers.

• Payroll Savers are serious savers—of the approximately $6 billion Series E Bonds which had become due up to the end of March, $4.5 billion, or 75%, were retained by their owners beyond maturity.

If you are not among the 45,000 companies that make the benefits of the Payroll Savings Plan available to their employees . . . or if you do have a Plan and your employee participation is less than 50%, a telegram or letter to Savings Bond Division, U.S. Treasury Department, Washington Building, Washington, D. C., will bring you all the information and assistance needed to build a *good* Payroll Savings Plan.

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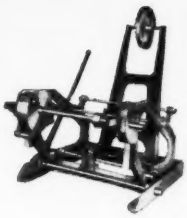
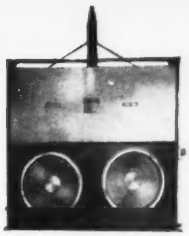
India RUBBER WORLD



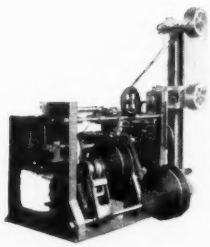
PAY-OFF

Equipped to take reels up to 36" in diameter. Cam-and-lever lift from floor. Mechanism is automatically self-braking, with brake activated by any slackening of wire speed. Rugged construction.



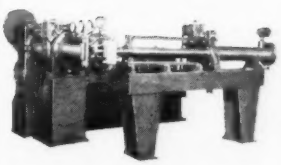
DAVIS-STANDARD CAPSTAN

Drag and pulling type. Supplies for almost all wire plant needs. Aluminum or cast iron drums, grooved or flat, in any radius desired. Gear reducers standard, four-speed transmission optional.



NEW-TYPE TAKE-UP

Great new efficiency. Quiet, vibrationless. No gears or clutches. Operates positively at high speeds. Reel drive by multiple V-belts. Automatic brake. Totally new traverse mechanism. Speed range choice for constant tension control. Built in two sizes: for reels 12" to 24" and 24" to 36".

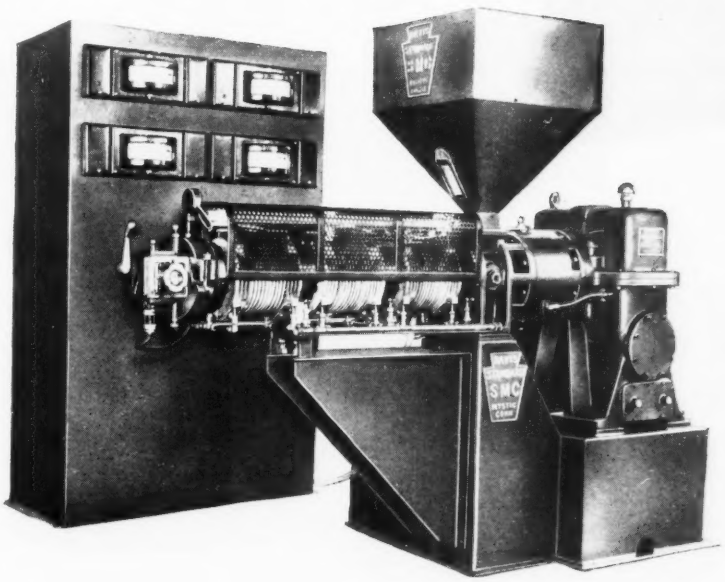


CONTINUOUS VULCANIZER

Heavy duty model assures uniform curing at high production rate. Made in 3¼", 4½", and 6" bore sizes for hot or cold fed compounds.

When is an Extruder an *Excluder*?

When it's a DAVIS-STANDARD



When you purchase superior extrusion equipment, you *exclude* troubles. That's why more and more companies are installing Davis-Standard extrusion equipment. They know that it *pays* to buy extruding machines from the world's largest manufacturer of custom-made extrusion equipment for rubber and thermoplastics.

Davis-Standard extruders assure high-velocity extrusion, maximum operating efficiency, and are available with accessory units which mean satisfying, profitable production.

DAVIS-STANDARD SALES CORPORATION

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SOLE SELLING AGENTS FOR

THE STANDARD MACHINERY COMPANY

EXTRUDING MACHINES AND MOLDING PRESSES

World's Largest Manufacturers of Custom-Built Extruding Machines

TIME SAVER...MONEY SAVER

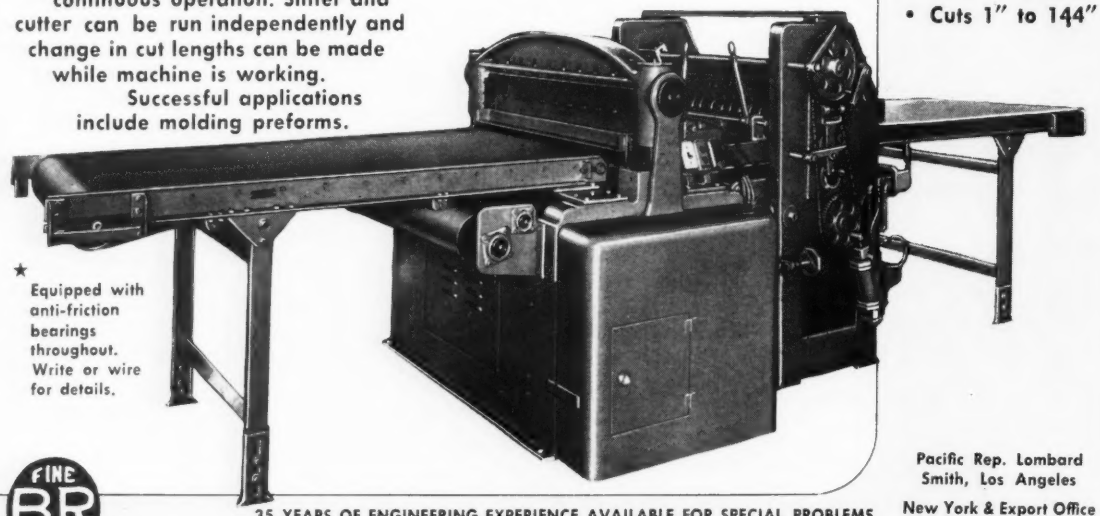
CUTTER *Combination* SLITTER

FOR FAST PRODUCTION!

- Save time
- Save labor
- Save space
- More accuracy
- Big capacity
- Slits 1" to 48"
- Cuts 1" to 144"

Now — cut and slit cured and uncured rubber stock in one continuous operation. Slitter and cutter can be run independently and change in cut lengths can be made while machine is working.

Successful applications include molding preforms.



★ Equipped with anti-friction bearings throughout. Write or wire for details.

FINE BR TOOLS

35 YEARS OF ENGINEERING EXPERIENCE AVAILABLE FOR SPECIAL PROBLEMS

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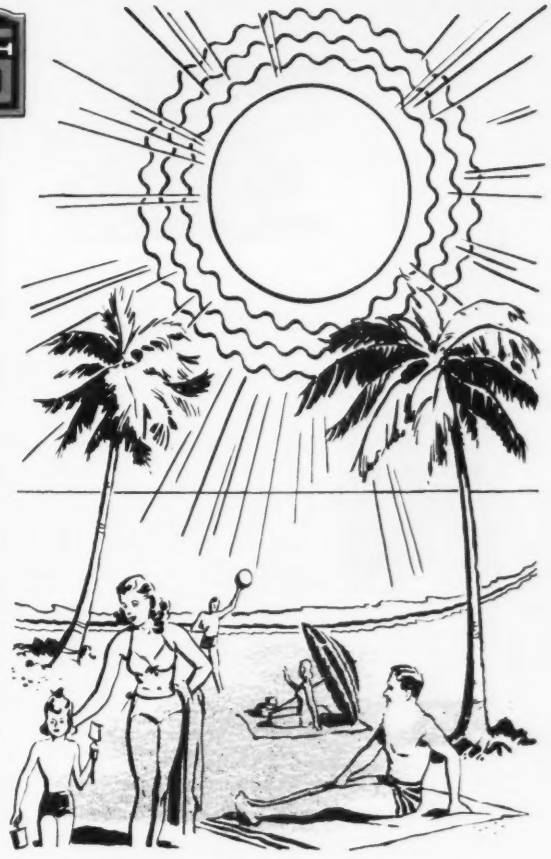


STABELAN HR

For Excellent Heat and Good Light Stability . . .

In Polyvinyl Chlorides and their copolymers STABELAN HR will serve as a "single package" stabilizer for high heat resistance plus good light stability . . . It is a synergized and chelated cadmium and barium compounded stabilizer which disperses easily in dry preblends, solutions and dispersions . . . It has been used with marked success in stabilizing all classes of organic and inorganic pigments — even delicate tints of organic reds and maroons.

STABELAN E

For Excellent Light and Good Heat Stability—Non-Plating on Rolls . . .

In Vinyl Plastisols, Organosols, Emulsions, as well as regular vinyl milled and calendered films, STABELAN E will provide a better stabilizer for ultra-violet and outdoor aging . . . It is a paste-form stabilizer that gives excellent light fastness and good heat stability, improves the transparency of clear films and gives films that do not "blush" and do not absorb water . . . It is compatible with all tested pigments — even organic reds hold their hue and age well when used with STABELAN E.

Mail this coupon today for Complete technical data on these stabilizers →

HARWICK STANDARD CHEMICAL CO.

AKRON, BOSTON, CHICAGO, LOS ANGELES, TRENTON

HARWICK STANDARD CHEMICAL CO.
60 South Seiberling Street
Akron, Ohio

Send complete technical information on STABELAN "HR" and "E" to—

Name_____

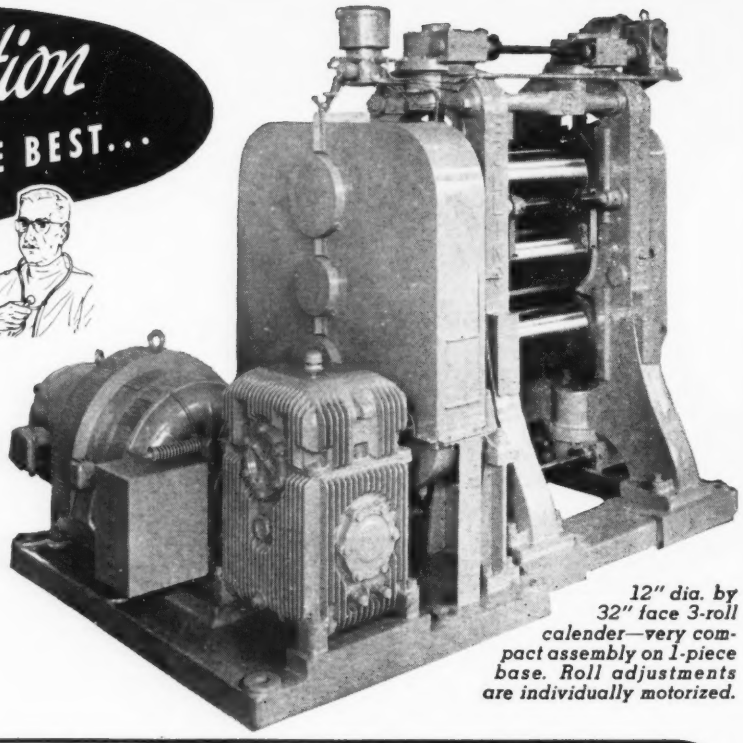
Address_____

City_____ State_____

Specialization
ALWAYS MEANS THE BEST...

Stewart Bolling makes a specialty of building a *moderately priced* line of laboratory and medium production sizes of 2-roll, 3-roll, and 4-roll calenders . . . Herringbone drive and even speed gearing develop exceptional smoothness and accuracy. Both first cost and maintenance are outstandingly low. Calenders are available in a range of sizes from 8" x 16" through 24" x 68".

Ask for Bulletin "W-7"



12" dia. by 32" face 3-roll calender—very compact assembly on 1-piece base. Roll adjustments are individually motorized.

STEWART BOLLING & COMPANY, INC.

3192 EAST 65TH STREET • CLEVELAND 27, OHIO

• INTENSIVE MIXERS AND MILLS • CALENDERS • REFINERS • CRACKERS HYDRAULIC PRESSES • PUMP UNITS BALE SLITTERS • SPEED REDUCERS

ALCOGUM AN-10

(SODIUM POLYACRYLATE)

Serves the latex compounding industry both as stabilizer and thickener.

ALCOGUM AN-10 is a 10% solution, having a pH of 10. Provides more effective viscosity control of compounds even during prolonged storage, and greater dilutability through adequate stabilization.

Distributors for Firestone Liberian Latex.

•

Our sales and technical staffs are at your disposal.

ALCO OIL & CHEMICAL CORPORATION

TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

NEW ENGLAND OFFICE
Alco Oil & Chemical Corp.
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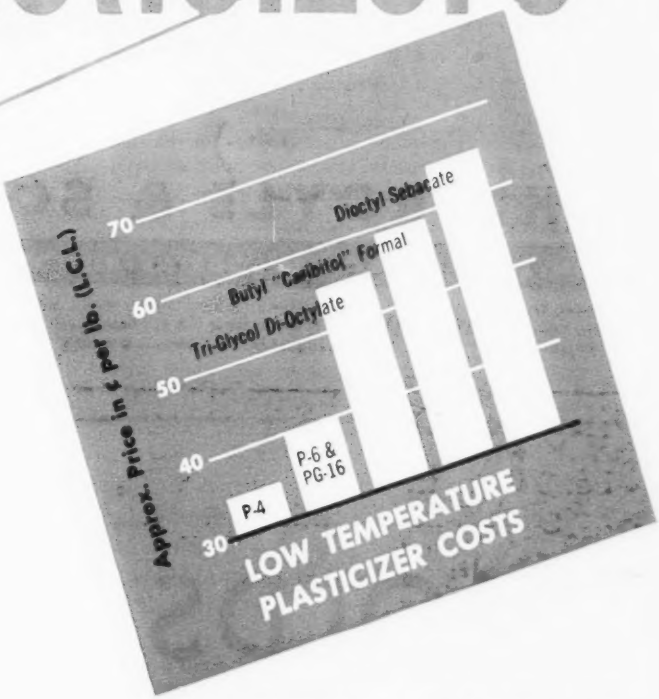
111 Westminster St., Providence 3, R. I.
Phone: ELmhurst 1-4559

HOW TO CUT COSTS ON LOW TEMPERATURE / LOW VOLUME SWELL

SYNTHETIC RUBBER

Plasticizers



FLEXRICIN® plasticizers are fully equivalent and, in many cases, superior to the commonly used low temperature plasticizers. Added features are their extremely low volume swell in aromatic fuels and excellent recovery on low temperature compression set. Their cost is much lower. Check this graphic comparison and you will see that costs can be cut substantially.

Flexricin Rubber Plasticizers:

PG-16, Butyl Acetyl Polyricinoleate	25% Nitrile Rubber
FLEXRICIN P-4, Methyl Acetyl Ricinoleate	40% Nitrile Rubber
FLEXRICIN P-6, Butyl Acetyl Ricinoleate	Neoprene GN
FLEXRICIN P-4, Methyl Acetyl Ricinoleate	GRS

ESTABLISHED 1807

THE Baker CASTOR OIL COMPANY

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LOS ANGELES • CHICAGO

Mail convenient coupon for 1 quart samples and technical data sheets. Please clip to your letterhead.

Baker Castor Oil Company
120 Broadway, New York 5, N.Y.

Please send samples of the Ricinoleate Esters checked or Technical Bulletin.

☐ **PG-16** ☐ **P-4** ☐ **P-6**

☐ **Technical Data**

Name_____

Firm_____

Address_____

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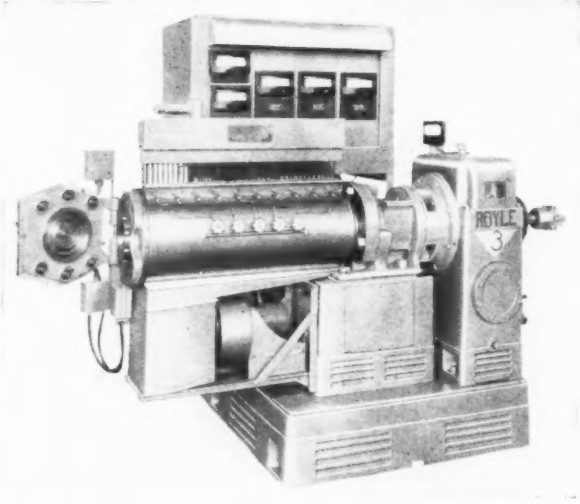
RW-73

FASTEST HEATING FASTEST COOLING



Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

*Patent Applied For

JOHN ROYLE & SONS

ROYLE PATERSON N. J.

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN 1880

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James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.
REgent 2430	SHerwood 2-8262	SWandale 4-5020	LOgan 3261

PATERSON 3, NEW JERSEY

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any capacity to

60 inches by 30 feet long

ACE MACHINE AND MOULD COMPANY, INC.

17 COLUMBUS AVENUE GARFIELD, N. J.

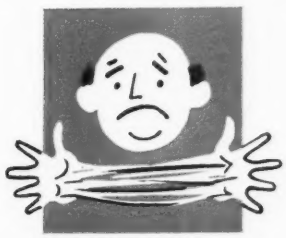
Designers and manufacturers of molds for rubber goods since 1925

We specialize in straight and varying cross-section molds for production of sponge rubber weatherstripping for aircraft and automotive industries.

Molds for use in McNeil and Glader presses.

We also manufacture molds for V-belts, belting, rails, etc.

DRY *but profitable facts about* SILENE



Columbia-Southern Silene — a finely divided precipitated calcium silicate—is widely known as an excellent and economical rubber reinforcing pigment. It is used extensively for such goods as soling, wringer rolls, drug sundries, mechanical and molded goods. But don't limit your thinking of Silene to reinforcing alone, because Silene has other extraordinary characteristics that may prove of real value to you in compounding.

The very fine particle size of Silene gives it unusual surface area and absorptive powers. Consequently, a few parts of Silene can be effective in drying up a sticky or gummy reclaim stock, for example, to a workable consistency.

Or, Silene can be used for changing liquid or gummy accelerators, or other compounding ingredients, into dry powders.

Or, Silene can be added to certain dry ingredients to increase flowability or prevent caking of the material in storage or handling.

If you think Silene can be of use in your operations . . . we shall be happy to supply you with experimental quantities and to offer our technical assistance.

IS YOUR COLUMBIA-SOUTHERN SILENE DATA UP-TO-DATE?

Much of our previously published Silene data has been revised and condensed. If you are interested in obtaining our new bulletin, write today, asking for Silene Bulletin No. 2.

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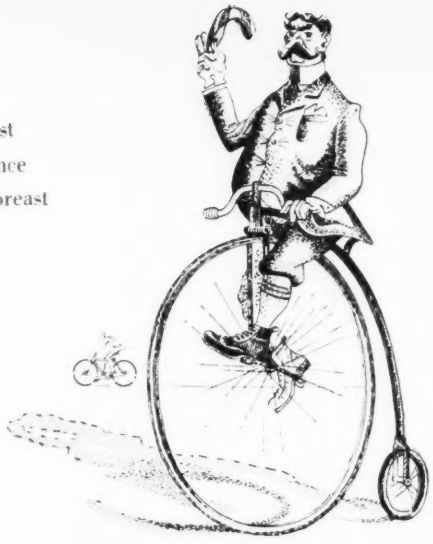
Grandfather had a hard life . . .

Cycle tyres stuffed with horsehair and cobbled streets must have made life a bit uncomfortable for Grandfather. Since the introduction of pneumatic tyres, we have kept full abreast of every development and today we are the leading manufacturers of cycle tyre producing equipment in the World.



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JOHNSON Rotary Pressure JOINTS

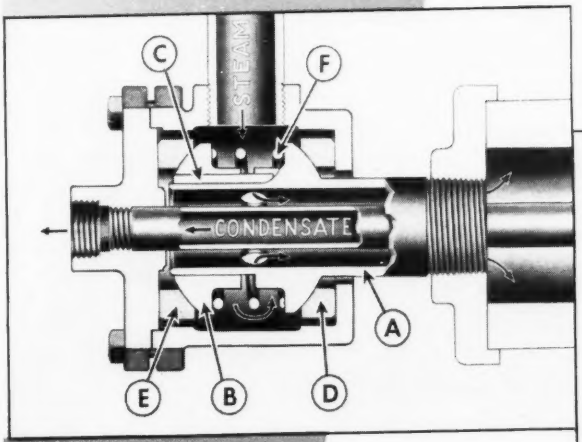
. . . to put steam or fluids into rotating machine parts . . .

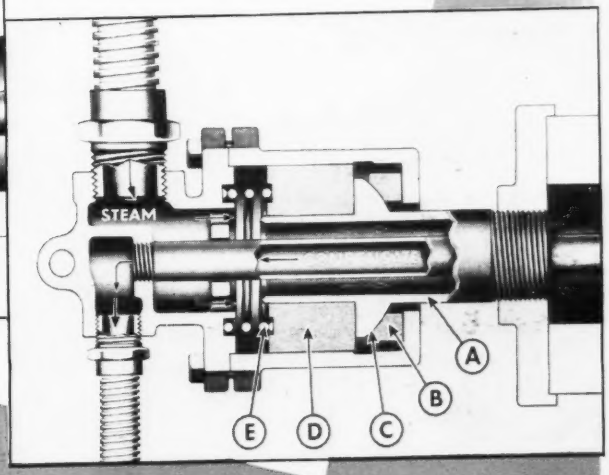
For years the Johnson Joint has been the most efficient, economical way to put heating or cooling agents into rotating rolls and cylinders. Adopted widely in the rubber, paper and textile industries, it is finding more and more applications all the time throughout industry.

Now Johnson Joints are better than ever. The new design is smaller, lighter weight and easier to handle. They cost less. Their wearing parts—the carbon graphite seal rings—have been redesigned for even longer life.

As always, they offer the basic advantages of being completely packless, self-lubricating and self-adjusting to varying pressures. Their simplicity of design makes them easy to service or repair right in the field. It has always been true that Johnson Joints quickly pay the cost of switching over, but never more so than right now. If you haven't fully investigated Johnson Joints don't fail to get the facts.

Available for all operating conditions—either through flow or syphon pipe service. Large range of sizes, covers wide range of pressures. *Write today for new Bulletins.*





NEW TYPE J

The Type J is basically the same Johnson Joint which has written an unequalled service record, and which has been adopted by so many machinery manufacturers. Besides reducing costly, hard-to-handle bulk, the new Type J brings many other refinements. The inlet is now in the side of the body, which makes easier both the piping hook-up and the task of properly centering the joint. The head design has been simplified to permit condensate outlet connection in any direction. There is also provision for a special assembly plate, between head and body, to facilitate removal of modern mechanical syphon pipes.

Cross-section view shows how nipple (A) is connected to roll or drum. Collar (B) is keyed at (C) to rotate with nipple, but fits loosely so pressure can fill entire housing. Seal ring (D) and bearing ring (E) are of special carbon graphite. Spring (F) is for initial seating only; in operation pressure is sealing force. Note self-aligning characteristics — the space around rings and nipple to provide for lateral movement of rotating assembly, and the spherical seating for angular movement.

NEW SERIES 2000 TYPE S

The Type S was big news when it was first introduced — as the self-supporting version of a device that was already the best known, most widely used of its kind. Now the new Series 2000 Type S is even better, offering size savings, weight savings, cost savings and even longer life.

Cross-section view shows how nipple (A) is connected to roll. Carbon-graphite seal ring (B) rotates against convex surface of collar (C). Joint assembly is supported by guide (D), which is also of long-lived, self-lubricating carbon graphite. Spring (E) is for initial seating only; in operation joint is pressure sealed.

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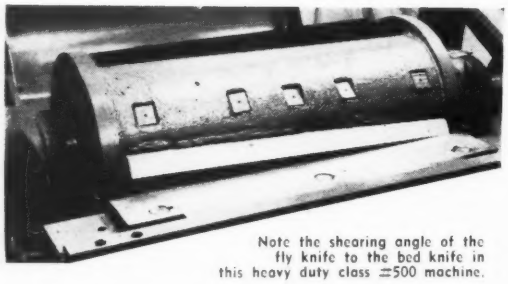
Rotary Pressure Joints • Compressed Air Separators and Aftercoolers
Direct Operated Solenoid Valves • "Instant" Steam Water Heaters

Apply This Unique Cutting Principle to Meet YOUR Rubber Cutting Problems—



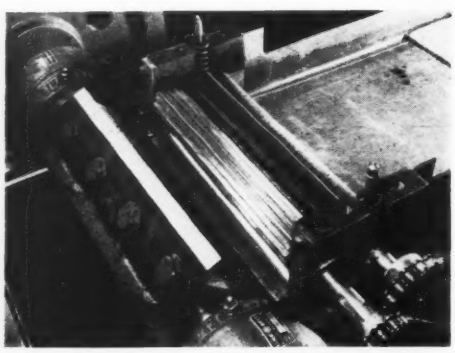
Note the shearing angle of the fly knife to the bed knife in this heavy duty class #500 machine.

TAYLOR-STILES
RUBBER CUTTING MACHINES

include types specifically suited to the many uses for them in modern rubber manufacturing. For example, cutting blanks into exact sizes for molding, for dicing prior to extruding or molding, for cutting into cubes for transporting or storing, for preparing stock for dissolving into cement, and for cutting scrap.

One feature they have in common — a revolving knife cylinder with knives so set that they engage the bed knife with a shearing action that produces—

- **clean cut pieces of uniform size and shape, with a minimum of fines—**
- **large production with low labor and power costs.**



Cutting and feed elements of a Class #100 machine.

Class 100 Cutters are precision cutters for relatively light stock.

Class 200 Cutters are precision cutters for heavier work.

Class 300, 400 and 500 for cutting large quantities of the heaviest kinds of stock or scrap rubber where precision is not required.

Send for folder No. App. 202 and for complete information concerning the Taylor-Stiles Cutter to do your rubber or other industrial cutting job efficiently and economically.

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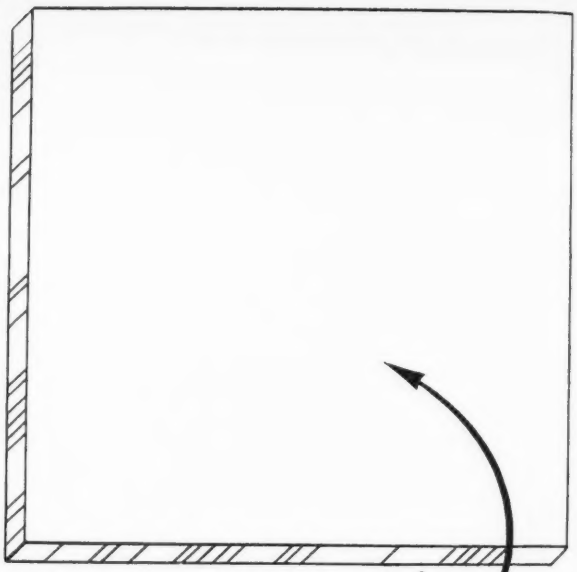

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are at home in every-day household items

When the woman of the house applies a new coat of aluminum paint to a radiator, or walks on mastic or rubber floor tile, or steps down to the basement on rubber stair-treads . . . she unconsciously proves the worth of Neville Resins! For it's these modern resins that add long life and wear to countless every-day household items, to say nothing of extra beauty and sales appeal so necessary to the manufacturer of such products.

- *We will be glad to help you select the right Neville Resin for your particular production need.*

THE NEVILLE COMPANY PITTSBURGH 25, PA.

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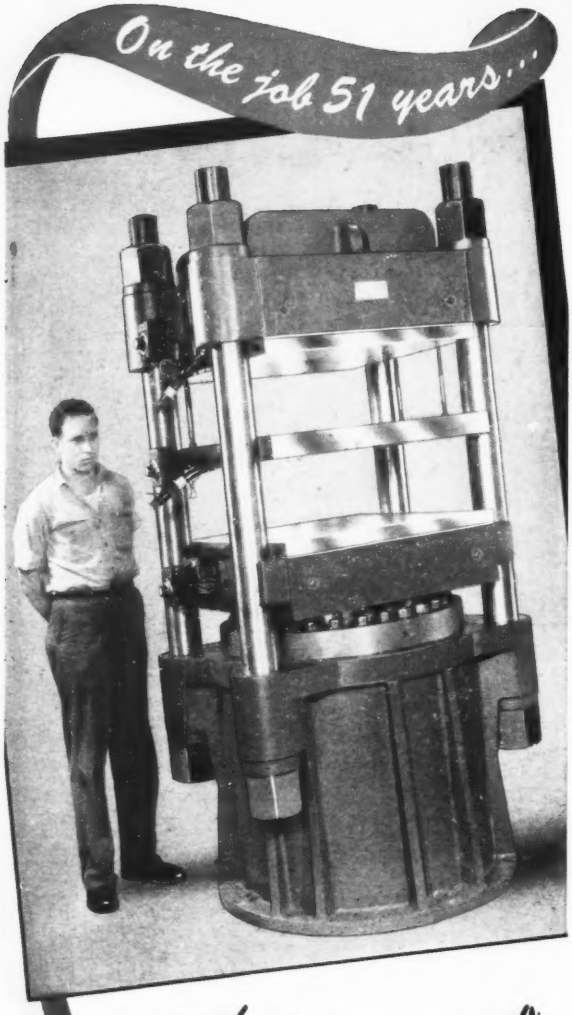

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The HOLMES HYDRAULIC PRESS

Fifty-one year old original models still operating efficiently--every day

YES, it's a fact! Original models of The Holmes Hydraulic Press--installed 'way back in 1901--are still producing day after day in big name rubber plants throughout the U. S. A. This amazing, half-century performance record is positive proof that The Holmes Hydraulic Press is an outstanding investment in--Uninterrupted Production...Minimum Maintenance...and...Maximum Output.

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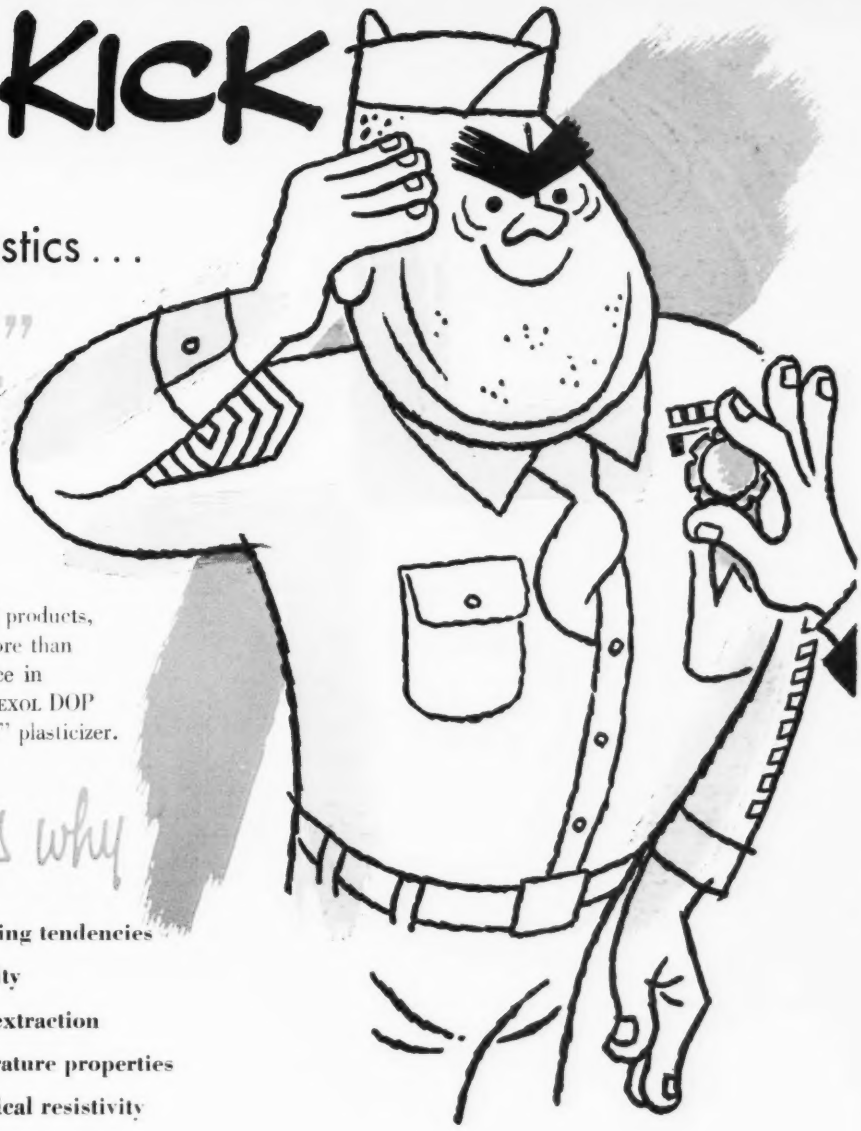

For your high quality vinyl products, choose the veteran with more than ten years of excellent service in the plastic industry . . . FLEXOL DOP . . . It's still the "Top Kick" plasticizer.

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Concerning properties, prices, and delivery of FLEXOL plasticizer DOP? Call or write any of our 21 offices located in principal cities. In Canada: Carbide and Carbon Chemicals, Limited, Toronto.

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Our products are engineered to fill every need in natural and synthetic rubber compounding wherever the use of vulcanized oil is indicated.

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of the industry's needs

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acknowledged superior by all users are important and valuable considerations to the consumer.

Write to the country's leading makers for samples and prices.

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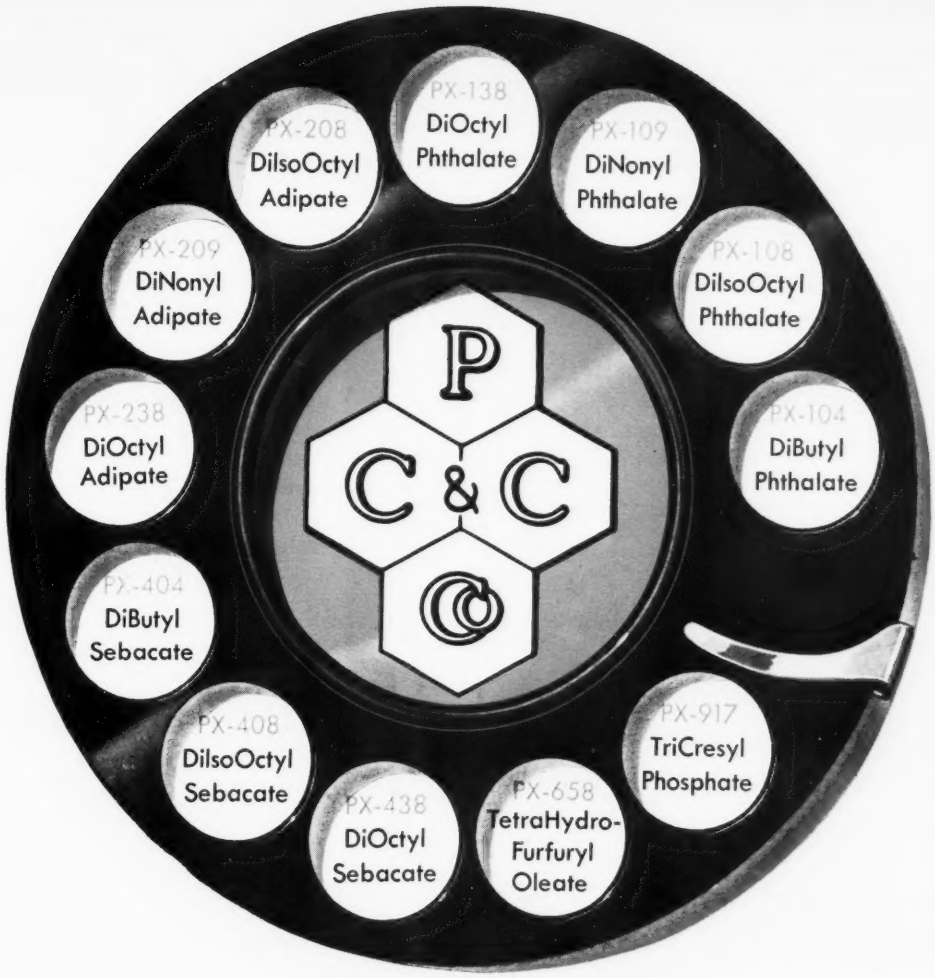

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Because we're *basic,* we quality-control every step of our integrated production—from coal to finished plasticizer. So you can be sure of peak plasticizer performance every time—regardless of the size of your order. ● *What's your plasticizer problem?* Heat resistance? Stability? Low temperature flexibility? Drop us a line and we'll help you select the *right* Pittsburgh PX Plasticizers from our broad plasticizer family. *Write today!*

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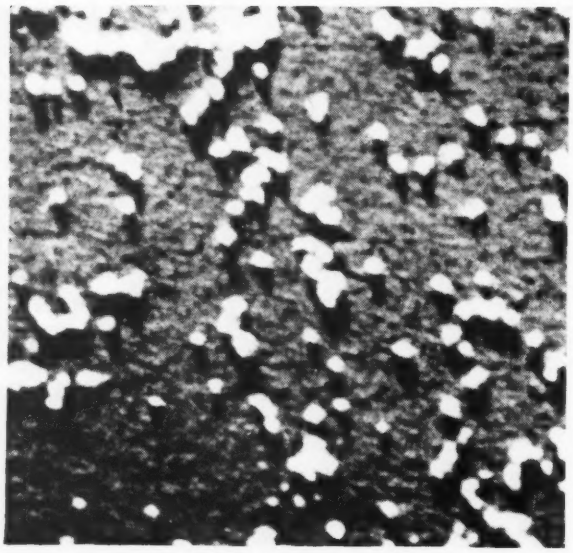
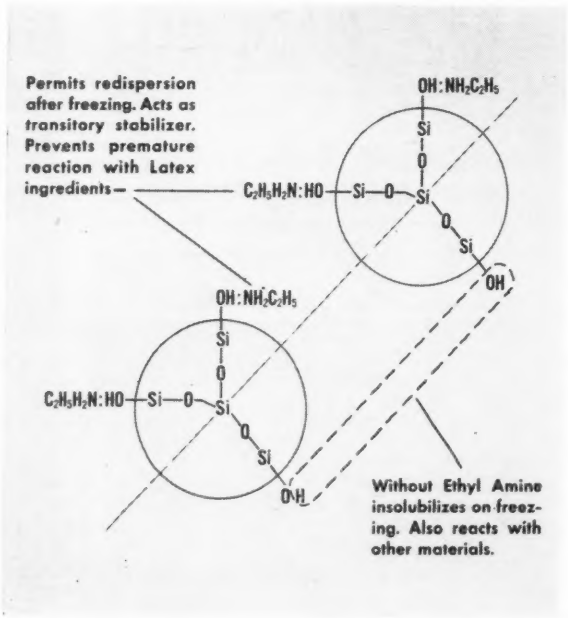
How Du Pont "LUDOX" can



What "LUDOX" is

"Ludox" is a 30% colloidal solution of almost pure amorphous silica particles (SiO_2) in the form of polymerized silicic acid. The electron photomicrograph—magnification 175,000 times—shows the fineness and uniformity of "Ludox" particles. The average particle's size of 17 millimicrons is below the range of the best carbon blacks.



Any of these valuable modifying effects can be produced by adding "LUDOX" to latex formulations

- Improved Adhesion
- Increased Stiffness
- Increased Water Resistance
- Increased Abrasion Resistance
- Decreased Dry Tack

How "LUDOX" works

The diagram at left shows surface hydroxyl groups on "Ludox" particles. These groups make the particles chemically reactive in contrast to commonly used dry fillers. This reactivity has led to many unusual properties and uses for "Ludox" in the latex field. The diagram also shows a typical "Ludox" reaction—with and without monoethylamine. The reaction with ethyl amine is useful in the stabilization of some latices containing "Ludox."

improve latex products

Your chemists can create new combinations of properties in latex-dipped goods, coatings, adhesives . . . whatever products you make—using Du Pont "Ludox"* colloidal silica. And new properties can mean new sales advantages —new markets for your products.

Here are some examples of how "Ludox" has improved latex products:

Neoprene thread was produced with a nearly doubled modulus over the entire range of elongation. Seven parts of "Ludox" were added per 100 parts neoprene latex. Modulus can be increased, too, in natural rubber films.

In neoprene-coated belting, adhesion was improved and flaking stopped by adding "Ludox." In a paper saturant, abrasion resistance was increased 20 to 40%!

A natural-rubber adhesive was doubled in strength of leather-to-leather adhesion when 20 parts of "Ludox" solids were added per 100 parts natural rubber latex solids. Such outstanding improvements have also led to the use of "Ludox" in GRS and neoprene latex adhesives and coatings.

An uncured Buna N solvent coating on cloth had no surface tack whatsoever when treated with "Ludox." In decreasing or eliminating tackiness, "Ludox" can be applied as an aftercoat or, in the case of latex, incorporated in the compound.

Neoprene films have shown exceptional increases in water resistance and decreases in water swelling upon addition of 20 parts "Ludox" solids per 100 parts neoprene latex solids.

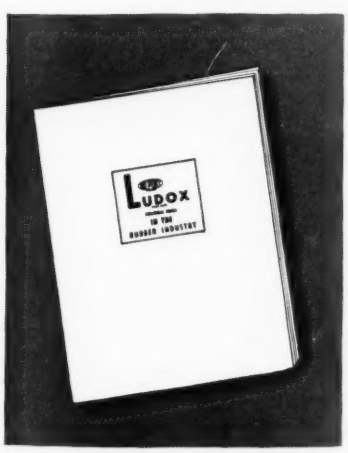
Neoprene foam required about 20% less solids to attain a given modulus when 5 parts of "Ludox" solids were added per 100 parts dry neoprene. This saving of raw material was obtained without affecting flex life, bend flex, or compression set.

In these and other cases "Ludox" has provided combinations of properties difficult to achieve by any other means.

What's more, a little "Ludox" goes a long way.

To learn more about how silica chemistry with Du Pont "Ludox" can help improve your products, mail the coupon below, or write on your letterhead today. *REG. U.S. PAT. OFF.

Send for this informative booklet: "'LUDOX' in the Rubber Industry"



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KAMLOK Couplings combine *speed, perfect performance, durability*—three features that are indispensable. *Fastest!* Perfectly tight, safe connection *in seconds*, by sliding coupler over adaptor, and pressing cam levers. KAMLOKS couple and uncouple *instantly*, regardless of "hookup." *Efficient!* No wasted *time—effort*, achieving leakproof-tight connection that guarantees consistently safe operation at peak efficiency. *Long-lasting!* Made of hard wear-resistant bronze to 3". 4" size of OPALUMIN, as strong as bronze, only ⅓ the weight. KAMLOKS add extra life to hose.

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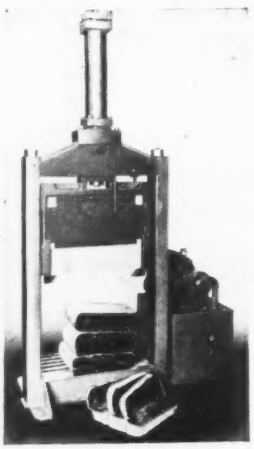

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ALL TYPES OF LIQUID LATICES
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AND SAMPLES

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They lower production costs when used to modify the degree of tackiness in the dry cement film.

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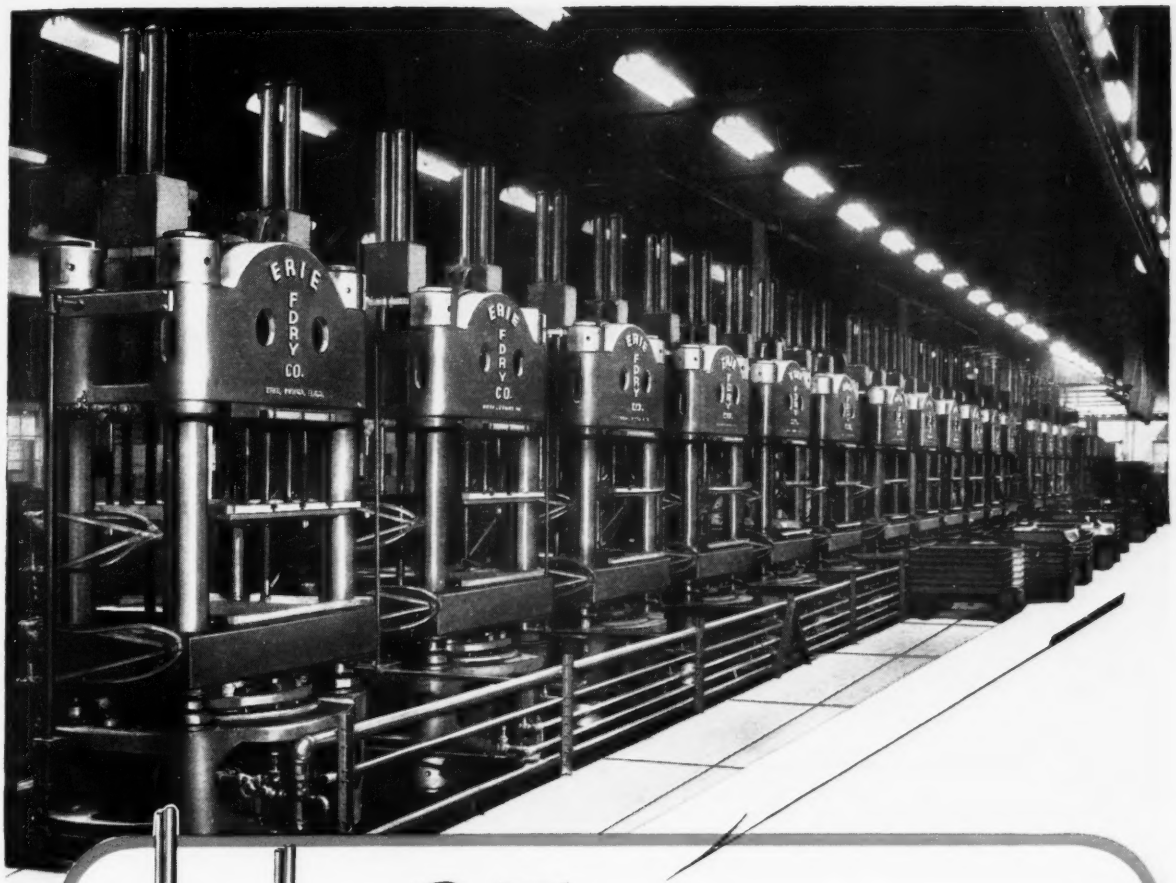

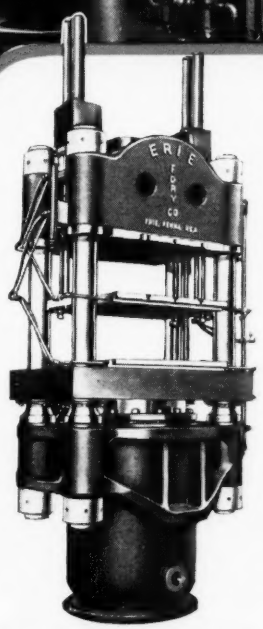

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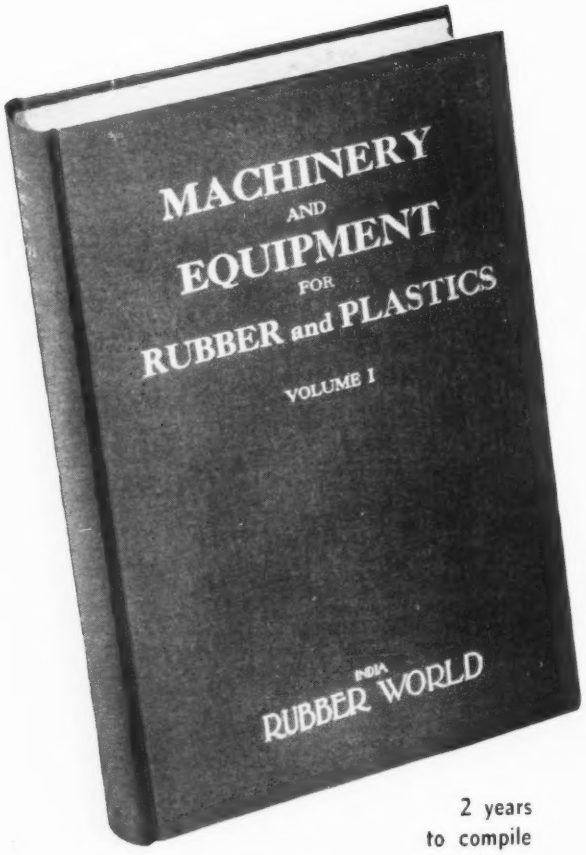

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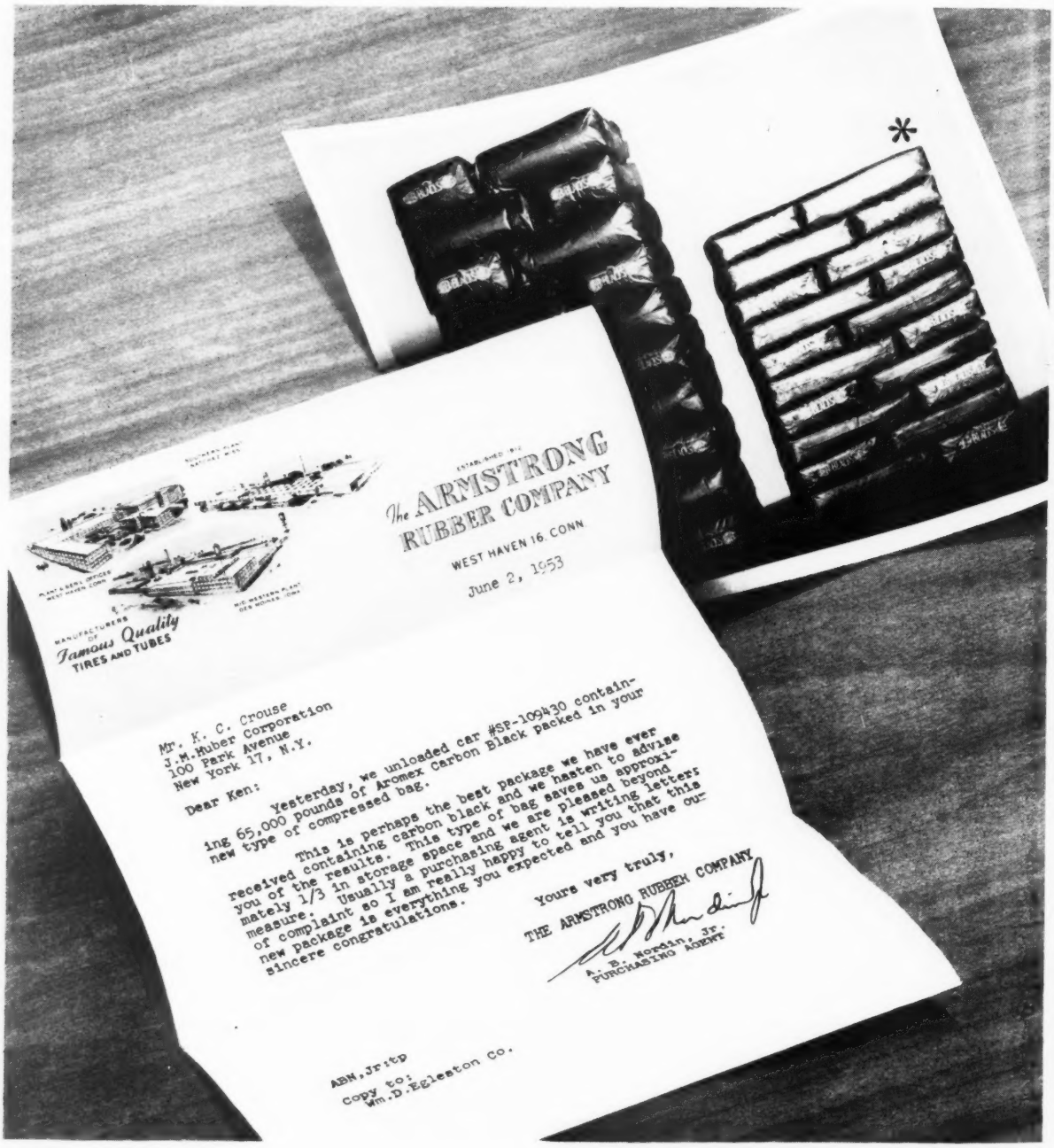
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Study of the Factors Affecting the Friction of Tread Compounds on Ice[1]

C. S. Wilkinson, Jr.[2]

EXPERIMENTS to study the frictional properties of rubber on ice have consisted almost entirely of tests upon tires mounted on motor vehicles; ice or snow covered highways and frozen lakes were the laboratories. Although these experiments have the advantage of similarity to normal conditions of use, they suffer from uncontrollable variables such as sudden changes in temperature, deterioration of the ice surface, and capability of the driver. It is not uncommon in slide-to-stop tests to have a range of two to one in the distances necessary to stop a car or truck in successive trials over the same course. Such variability occurs for tests with both synthetic and natural rubber tires.

A more sensitive laboratory test in which the variables could be carefully controlled would seem to be most useful. Little has been published concerning such tests. Conant, Dum, and Cox (1)[3] measured both static and dynamic coefficients of friction for a number of compounds. They used an apparatus in which the test piece was repeatedly drawn along a linear path at a velocity of 0.48-foot per second. The coefficient was calculated from an average value of the frictional force. More recently Pfalzner (2) described experiments using a machine in which a circular track of ice was revolved against sled-like rubber samples. The samples were lightly loaded and were run at velocities of up to 12 feet per second. In both these experiments the entire apparatus had to be used in a cold room, resulting in a limited range of temperatures and difficult working conditions for the operator.

In setting up the present experiment the aim was to be able to control the experimental variables closely and yet be able to change conditions at will over a wide range. It was decided to design a compact machine which could be placed in a laboratory sub-zero cabinet for operation. In this way the temperature could be varied over a wide range, but held within close limits at any desired point. The operator, being outside and at room temperature, could work more comfortably and make accurate observations more easily.

Apparatus

A diagram of the apparatus is shown in Figure 1. The ice is frozen in an aluminum tray which revolves under the stationary samples. The outside diameter of the tray is one foot. On each leg of the tripod above the ice tray is an adjustable brass slider counterbored to hold a sample. These sliders may be adjusted rapidly to determine the path of the samples. Weights for vertical loading slip down over the center post and rest upon the tripod.

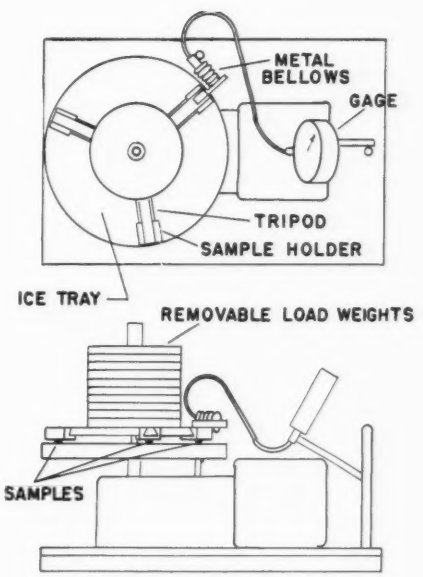


Fig. 1. Diagram of Apparatus

The oil-filled sylphon bellows and the pressure gage are ordinarily used to measure the frictional force. For several special experiments they were replaced by a strain

[1] Presented before the Division of Rubber Chemistry, A. C. S., Buffalo, N. Y., Oct. 30, 1952. Contribution No. 196 from research laboratory, Goodyear Tire & Rubber Co., Akron, O.
[2] Goodyear Tire & Rubber Co., Akron.
[3] Numbers in parentheses refer to Bibliography items at end of this article.

gage recording element and bridge arrangement. As the ice tray revolves, the tripod, with samples in contact with the ice surface, tends to move with it, but is restrained by the reaction of the bellows against one leg. This reactive force is indicated as pressure on the gage and can be converted into frictional force by multiplying by the effective cross-sectional area of the bellows.

The vertical load is the weight of the tripod and samples, six pounds, plus any added weights.

The mechanism for turning the ice tray is a commercial variable speed drive with a micrometer adjustment for varying its velocity continuously over the range from zero to 118 rpm.

Figure 2 is a photograph of the apparatus while in operation. The cover of the sub-zero cabinet has been removed temporarily to allow the photograph to be made.

Method of Freezing Ice for Use in Friction Experiments

Variations in friction due to differences in ice crystals may be minimized by carefully freezing the ice according to a definite procedure. Aside from having uniformity of crystal structure it is desirable that the ice be: (1) transparent; (2) flat and level; (3) crack free.

Air bubbles in the ice are to be avoided if the surface is to be uniformly smooth. Concentrations of air bubbles will modify the friction in spots where they are present. Flatness and levelness are necessary for steady gage readings. Although fine cracks cause no trouble themselves, there is a tendency for the ice to chip in the vicinity of a crack, producing an uneven surface.

The exact procedure used in preparing the ice for these experiments will be described for the benefit of those who may be beginning similar experiments. First, the aluminum tray from the apparatus was placed in a —29° C. cold room at least ½ hour before filling. Distilled water, meanwhile, was boiled for five or ten minutes in a filter flask to drive out dissolved air; then the flask was stoppered while still containing only vapor above the water. The flask containing water and vapor was placed in a bed of dry ice until ice crystals began to form on the inner walls of the flask, indicating that the mass of water was at about 0° C.

The stopper was then removed, and the chilled water poured into the cold tray. Both were left in the cold room at —29° C. for several hours until the water was completely frozen. During this interval some air from the room was invariably absorbed, but the bubbles formed were generally close to the surface and could be subsequently removed.

Flattening and leveling of the surface was done after the tray had been transferred back to the laboratory low-temperature cabinet. For this operation auxiliary apparatus was added to the original machine. To a rigid steel rod screwed into the base and projecting vertically beside the ice tray and several inches above it was hinged a steel bar extending horizontally over the ice and directed radially toward the center of the tray. (The hinge was merely a V-type laboratory clamp resting on an adjustable collar around the vertical rod.) A sharp tool bit was held securely in place at the end of the bar by means of a C-clamp. This bit could be adjusted downward to make contact with the ice surface. The ice could be "faced off" smooth and level by slowly moving the tool across its surface while the tray revolved at a high speed, about 115 rpm. The tool was moved by rotating the horizontal supporting bar about the hinge joint. After each cut the tool bit was lowered a few thousandths of an inch to make the next cut.

Finally, a glass-smooth surface was obtained by placing

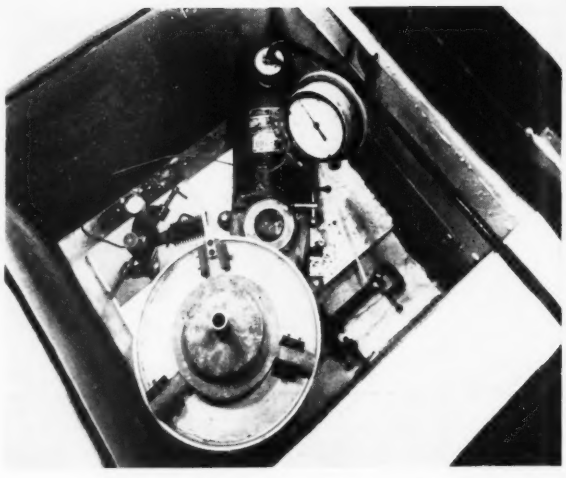


Fig. 2. Photograph of Apparatus While in Operation

an infrared heat lamp just above and to one side of the tray and rotating the tray at a slow speed, just fast enough to allow a very thin film of water to be melted. Refreezing took place during the part of the revolution when the melted ice was on the side not directly under the lamp. Cracks, which invariably occurred when the temperature was reduced to below —40° C., were mended by raising the cold box temperature to slightly below 0° C. and using the lamp in the above manner.

Refacing could be done at any time during a series of tests. Whenever the ice had been reworked to a point where about half of it had been used up, the tray with its remaining ice was returned to the —29° C. room, and water added to restore the original level. The thin layer of ice already in the tray seemed to facilitate freezing of new ice, possibly by furnishing nuclei.

With careful use a tray of ice could be made to last several weeks, with only occasional reworking to be sure of an uncontaminated surface. Between tests the ice surface was carefully covered to minimize condensation and freezing of atmospheric moisture on the surface.

Compounds Used

The compound formulae used are given in Table 1.

Table 1. Compound Formulae Used

	A	B	C	D	E	F	G	H	I
GR-S X445 (cold rubber)	100								
GR-S-10		100							
GR-S			100		100	100	100	100	100
Smoked sheet				100					
HAF (Philblack O) carbon black	50	50	50	50	20	35	50	60	
MT (Thermatomic) carbon black									60
Zinc oxide	5	5	5	5	5	5	5	5	5
Sulfur	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Amax (Vanderbilt)	.75	.75	.75	.75	.75	.75	.75	.75	.75
Diphenylguanidine	.25	.25	.25	.25	—	—	—	—	.25
Phenyl-beta-naphthylamine	—	—	—	—	.25	.25	.25	.25	—
Stearic acid	—	—	—	1.0	1.0	1.0	1.0	1.0	1.0

Calculation of Coefficient of Friction

The coefficient of friction, k, is calculated as the ratio of the frictional force, F, to the vertical load, L, according to the equation

$$k = \frac{F}{L}$$

For many materials k is a constant over a wide range of experimental conditions. In the case of rubber sliding on ice it proves to be a variable depending upon the pres-

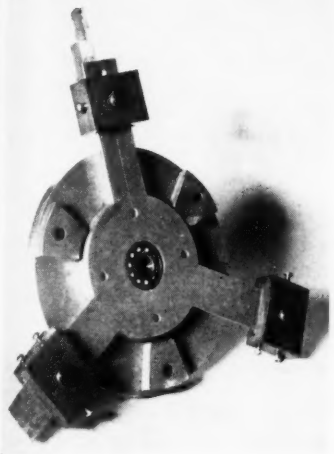


Fig. 3. Samples in Tripod Holder

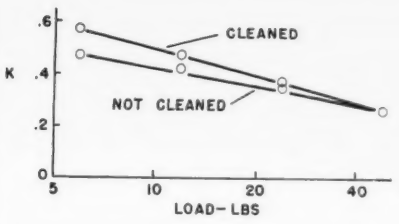


Fig. 4. Effect of Cleaning Sample Surface (Temperature, —20° C.; GR-S Tread C; Cure, 55 Minutes at 275° F.)

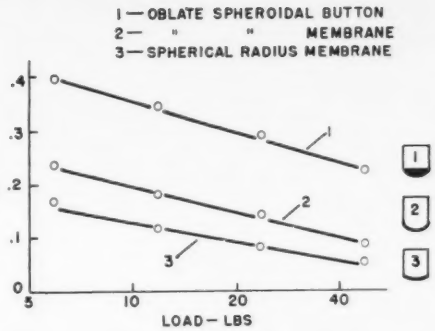


Fig. 5. Effect of Sample Shape and Thickness (Temperature, —20° C.; GR-S Tread C.; Cure, 55 Minutes at 275° F.)

sure, velocity, and temperature. The above equation may be more properly written, therefore, as:

$$F = f(P, v, T) L$$

where P is the pressure of the rubber on ice, v is the velocity, and T the temperature.

Test Variables

Results may be influenced to some extent by factors unique to the apparatus or type of test. In this category may be included: (1) type of sample used; (2) velocity of sliding; (3) path of sample; (4) method of applying load. These variables were studied, and the degree of reproductibility was examined.

Several shapes of test pieces were tried during the course of the various experiments. A rubber cylinder ½-inch high by ½-inch in diameter was first used. When the cylinder was inserted in the counterbored holder, ⅛-inch of its length projected. Both sharp and beveled edges were checked. Such a sample has the advantage of being easy to make and in many cases gives reproducible results. It has the disadvantages of occasionally picking up ice crystals on its contact face and also of tending to vibrate under certain conditions. This vibration is particularly noticeable with softer compounds.

A flat disk of rubber ½-inch in diameter and 0.060-inch thick cemented to the end of a ½-inch diameter metal cylinder proved an improvement in the matter of vibration. It still was objectionable, however, for picking up ice crystals on its face.

A modification of the last sample has been quite satisfactory. The disk is molded into the shape of half of an oblate spheroid with a maximum thickness of 0.1-inch. The photograph of Figure 3 shows three of these samples in place in the tripod. Vibration is greatly reduced, and picking up of ice is practically eliminated. Samples have been used just as they are when removed from the mold and also after light buffing with Crocus cloth. Figure 4 shows results of an experiment to study the effect of this buffing. Any bloom which occurs between the time of curing and actual testing is also removed by the buffing.

The effect of using extremely thin samples is shown in Figure 5. Here a molded button 0.1-inch thick is compared with membranes of identical rubber stretched tightly over metal plugs. The plug used for the middle curve was shaped very nearly like the molded button; while the plug used for the bottom curve was an exact spherical shape having a radius of curvature of ½-inch. The membranes in both cases were about 0.002-inch thick. The reduction in the frictional force shown with these membranes is believed to be due to their inability to maintain intimate contact with the ice surface.

All data for Figures 6 through 18 were obtained using the oblate spheroid type of test pieces.

The contribution of velocity to the variation in the frictional force is most interesting. In Figure 6 are shown the changes in the coefficient of friction of a GR-S tread compound at —10 and —20° C. as the range from 0.08-centimeter per second to 70 centimeters per second is covered. A log scale was used for the velocity axis in order to spread out the low speed end. It may be seen that in both instances there is an abrupt rise in friction as the velocity is increased, reaching a maximum at around 2 centimeters per second; then the friction gradually declines. Part of the upper curve has been replotted on a linear scale in Figure 7 to show the abrupt rise and gradual fall in their true proportions. Figure 8 gives a family of curves to show the persistence of this effect over a range of loads, with a different type of compound used.

Practical evidence of this dependence of friction upon velocity has been offered by Grace and Winter (3) in a recent publication. In describing test runs by trucks on snow and ice covered roads these authors state that to gain maximum acceleration the wheels must be spun, but that excessive spinning slows down the rate of acceleration.

The special case where velocity approaches zero, that is, so-called static friction, was also studied. To make this study the apparatus had to be considerably modified. The key between vertical drive shaft and ice turntable was removed so that the table could be revolved without use of the variable speed drive. A music wire 0.012-inch in diameter was wound around the periphery of the turntable and led through a pulley arrangement to an external motor and reducing gear box. By this means the turntable could be started into motion without any vibration and revolved at an extremely slow velocity. The measured velocity was 0.006-inch per second, too slow to be detected by eye.

To follow and measure quickly the changes in frictional force it was necessary to use a more sensitive device than the sylphon bellows. A spring steel cantilever beam with a Baldwin SR-4 strain gage element on each side was installed instead. The signal from this was fed into a Brush BL 320 bridge, the amplified output of which was used to actuate a BL 202 magnetic pen recorder. This equipment was capable of recording the changes in force within approximately 0.01-second.

The test pieces were placed in their mountings and precooled for ten minutes before being put in contact with the ice surface. After they had been kept standing in stationary contact with the ice an additional ten minutes, the ice tray was put into motion, and the force against the

restraining spring recorded. The curves of Figure 9 show the stress build-up as the spring is deflected to the point where its reaction equals the static friction between the rubber and the ice, the sudden drop from this maximum, and finally the steady sliding, or kinetic, friction.

In another experiment the dependence of the static friction upon the interval of time for which the samples were in stationary contact with the ice was determined. Results shown in Figure 10 were obtained using a *Hevea* tread compound. When the contact interval was 15 minutes, the difference between static and kinetic friction was quite pronounced. However, as the standing time was lessened, the difference between static and kinetic friction decreased, until at one-minute standing time it was not discernible.

Although static friction is undoubtedly much higher than kinetic friction after standing contact for a short interval, its transient nature rules out any consideration of it as being of much importance for practical applications.

The question arises as to what effect, if any, might result from rotating the same path of ice against the samples. The most likely effect would be to reduce the friction due to a residual water film in the path. If this were the case, then staggering the samples so that they are in three separate paths should increase the friction. Results from such an experiment are shown in Figure 11. For very low temperatures there seems to be no difference; but as the ice temperature approaches its melting point, the single track friction becomes slightly lower.

In actually running the test the method of applying the vertical load and the length of time the test is run can exert considerable influence upon the value of the frictional force. This point is illustrated in Figure 12. The ice was prepared in the usual way, and the tripod and the samples were put in place upon the moving ice. After ½-minute of sliding, the pressure gage was read, and the vertical load doubled by adding six pounds. In another ½-minute (one minute total elapsed time) a second reading was taken, and the load again doubled. At 1½ minutes a third reading was made, and the load doubled, making a total of 48 pounds. Loads were then similarly removed in reverse order back to six pounds, after which operation the whole procedure was repeated. The samples were in sliding contact with the ice during the whole process.

As may be seen from the curve, the coefficient is approximately the same for the 48-pound load in both cycles, but shows a definite increase for the lesser loads. Apparently, once the rubber has been pressed against the ice by heavier loads, its shape is altered so that it makes more intimate contact; and subsequent values of the coefficient of friction are greater at the lighter loadings.

TABLE 2. TEST FOR REPRODUCIBILITY

Compound C GR-S Tread Stock
Cure 55 Min. @ 275° F. Temp. −10° C.

Running Time Min.	Load Lbs.	k_1	k_2	k_3	kav	Av. Dev.
0.5	6	.198	.198	.176	.191	.010
1.0	12	.154	.148	.143	.148	.004
1.5	24	.118	.107	.118	.114	.005
2.0	48	.085	.077	.086	.083	.004
2.5	24	.132	.099	.132	.121	.015
3.0	12	.187	.187	.192	.189	.002
3.5	6	.275	.275	.275	.275	.000
4.0	12	.187	.181	.176	.181	.004
4.5	24	.127	.118	.121	.122	.003
5.0	48	.085	.076	.082	.081	.003
5.5	24	.138	.124	.132	.131	.005
6.0	12	.204	.192	.198	.198	.004
6.5	6	.308	.286	.286	.293	.010

k_1—immediately after preparing.
k_2—one hour later.
k_3—15 hours later.

Reproducibility was checked by a continuation of the above experiment. The entire run was repeated one hour later without having disturbed the ice in any way except to brush off the surface, and again after 15 hours. Results of these tests are given in Table 2.

While these results indicate that good agreement may be obtained in duplicate tests, it should be pointed out that the same ice was used for all three runs. When different ice is used for separate tests upon the same samples, variability may be greater.

Types of Ice

There is a possibility that the difficulty of reproducing results may be due in part to differences in the ice itself. A brief survey of the literature indicates that investigators have from time to time observed different forms of symmetry in ice.

In 1921, Dennison (4) wrote that as a result of X-ray diffraction studies he believed that the lattice of an ice crystal corresponded to a hexagonal close packed arrangement of molecules consisting of two sets of interpenetrating triangular prisms with sides of 4.52 Å and height of 7.32 Å. Shortly afterward Bragg (5), making use of Dennison's data, suggested that each oxygen atom was at the center of gravity of four neighboring oxygen atoms, from each of which it was separated by a hydrogen atom. The dimensions of the structure agreed with Dennison's figures.

Selyakov (6), experimenting with ice in constant temperature rooms at −8° and −1° C. showed that ice existed in two forms, alpha and beta. The former belongs to class D_{6h}, D_6, C_{6v}, or D_{3h} and the latter to C_{3i} or C_3 (7). The units of both classes are about equal, C = 7.34 Å and A = 4.52 Å. He believed that there were four molecules in each lattice. Rogers (8) at about the same time reported from a study of snow and ice crystals that ice belonged to the dihexagonal pyramidal class (A66P) of the hexagonal system. Later, Hildebrand (9) spoke of ice as having an open, continuous structure, like that of tridymite, and containing no permanent individual molecules.

Steinmetz (10) claimed that snow formed at −12° C. showed a prismatic habit with thin hexagonal plates at the two ends; and he concluded that ice is probably of dihexagonal-bipyramidal symmetry, but may also be of a di-trigonal class. Finally, Frank (11), in 1946, reported results of freezing water at −72° C. in which octahedra and sometimes tetrahedra or cubes were formed. These melted at −70° C.

Hexagonal plates, as reported by Steinmetz, have been observed in ice used in the present friction experiments. These plates appeared upon a surface which had been allowed to melt and then refreeze at about −20° C.

From the above survey it may be concluded that although the types of ice crystals observed are similar, there are probabilities of obtaining differences; and these may explain at least in part the difficulty of exact reproducibility of results.

Ice and Rubber Variables

In addition to the variables which may be thought of as being peculiar to the apparatus or method of operation are several which are characteristic of the ice and rubber themselves: namely, (1) temperature; (2) pressure; (3) polymer or compound. A satisfactory explanation of the friction between rubber and ice should take these into account.

The low friction between rubber and ice is thought due to the lubricating action of a film of water between them. If this is the case, then as the temperature is progressively lowered, refreezing of this water will become more rapid, and the thickness of the film less. Eventually the

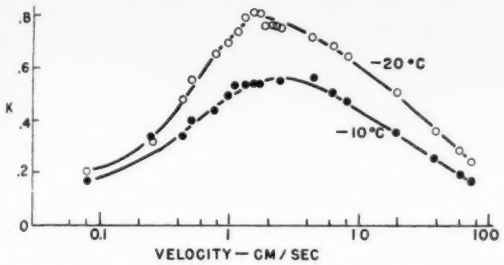
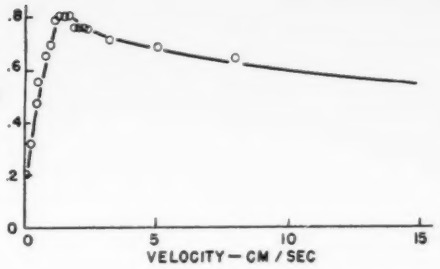


Fig. 6. Change in Friction with Velocity (Load, 24 Pounds; GR-S Tread F; Cure, 20 Minutes at 300° F. Log Scale—Velocity Axis)

(Right)

Fig. 7. Change in Friction with Velocity (Load, 24 Pounds; GR-S Tread F; Cure, 20 Minutes at 300° F. Regular Scale — Velocity Axis)



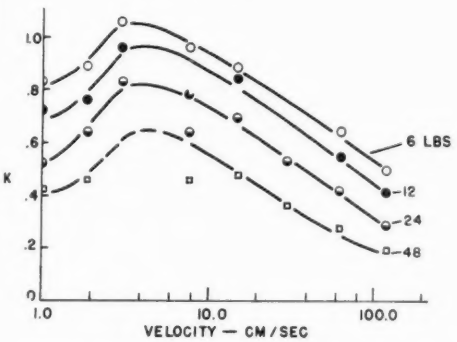


Fig. 8. Friction as a Function of Velocity at Several Loads (Temperature, —20° F.; GR-S Tread I; Cure, 20 Minutes at 300° F.)

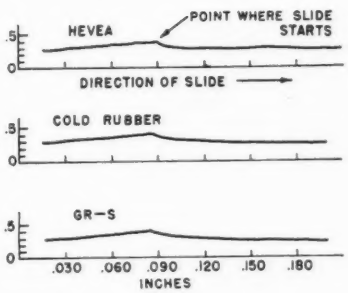


Fig. 9. Transition from Static to Kinetic Friction (Temperature, —20° C.; Pressure, 30 PSI.; Velocity, 0.006-In./Sec.; Standing Time, 10 Minutes)

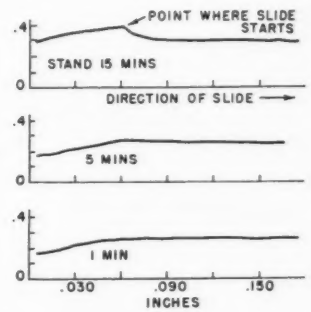


Fig. 10. Dependence of Static Friction upon Interval of Standing in Contact with Ice (Temperature, —20° C.; Pressure, 30 PSI.; Velocity, 0.006-In./Sec.; *Hevea* Tread Compound

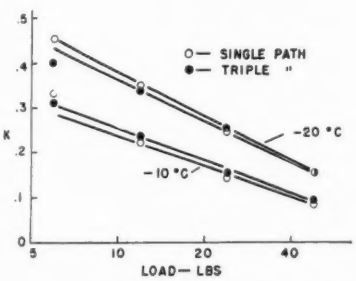


Fig. 11. Effect of Sample Path (GR-S Tread C; Cure, 55 Minutes at 275° F.)

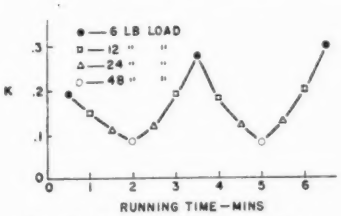


Fig. 12. Effect of Method of Testing (Temperature, —10° C.; GR-S Tread C; Cure, 55 Minutes at 275° F.)

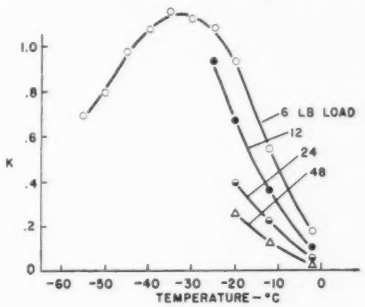


Fig. 13. Effect of Temperature (GR-S Tread C; Cure, 55 Minutes at 275° F.)

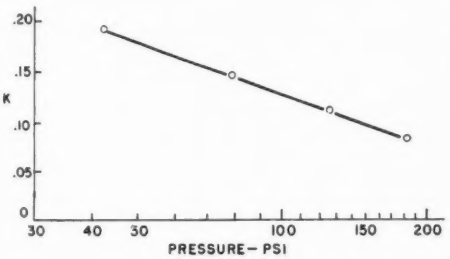


Fig. 14. Variation of Friction Coefficient with Pressure (Temperature, —10° C.; GR-S Tread C; Cure, 55 Minutes at 275° F.)

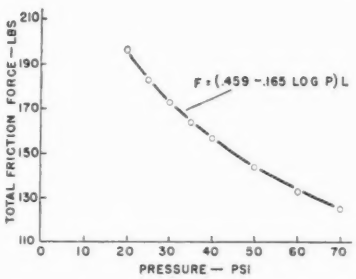


Fig. 15. Calculated Total Frictional Force at Increasing Pressure and Fixed Load (Load, 800 Pounds; Temperature, —10° C.; GR-S Tread C; Cure, 55 Minutes at 275° F.)

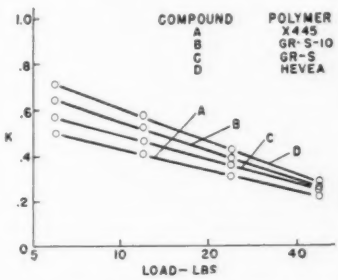


Fig. 16. Comparison of Tread Compounds of Different Polymers (Temperature, —20° C.)

film will become so thin that the friction will be similar to that between an ordinary smooth solid and rubber.

The curves in Figure 13, which were obtained from measurements at a series of progressively lower temperatures, show the above supposition to be correct. With the six-pound load the friction coefficient increases rapidly to a maximum value as the temperature is progressively dropped from 0° to —30° C. The curves for the heavier loads show like trends, but do not reach a maximum because the frictional forces at the lower temperatures exceed the limit of the apparatus.

After the maximum has been reached, vibration sets in between the rubber and the ice, with the result that the frictional force shows an apparent decrease as the temperature is lowered further. A similar phenomenon was re-

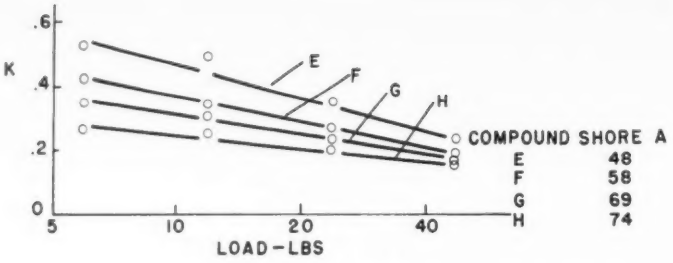


Fig. 17. Dependence of Friction on Hardness (Temperature, —20° C.; GR-S Treads; Cure, 20 Minutes at 300° F.)

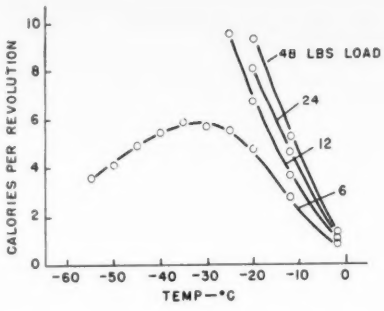


Fig. 18. Calculated Heat Generated per Revolution of Ice Tray (GR-S Tread C; Cure, 55 Minutes at 275° F.)

ported by Roth, Driscoll, and Holt (12) as occurring with increase in velocity of rubber drawn across glass. The stick-slip mechanism responsible for the vibration will be discussed later.

Differences between tread compounds become less pronounced as the testing temperature approaches 0° C. For example, in one group of tests a natural rubber tread showed a friction coefficient 42% higher than a similar GR-S tread when tested at —20° C. When compared at —10° C., the natural rubber compound was only 5.5% better than the synthetic. Difficulty in differentiating between various compounds in a consistent way in road tests may be due in part to temperature variations.

According to the classical theory of friction, the force is independent of the apparent area of contact between the rubbing surfaces and depends only upon the normal load. The explanation is that actual contact is between surface asperities, and with increase of normal load the number of asperities in contact will increase in proportion. In the case of rubber this is only partially true. An increase in load, producing an increase in pressure, causes an increase in the frictional force, but at a decreasing rate. Consequently the coefficient, k, is not a constant, but is a variable dependent upon the value of P, the pressure. It has been found, as shown in Figure 14, that k decreases according to the logarithm of the pressure. For this particular compound the relation may be expressed mathematically as:

$$k = C_1 - C_2 \log P, \quad P > 0$$

where $C_1 = .459$

$C_2 = .165$

These constants might be used as criteria of the merit of a compound. A high value of C_1 in connection with a low value of C_2 would be indicative of good frictional properties.

Carrying the above analysis a step further illustrates the practical significance of the phenomenon. The frictional force which will be obtained with a fixed load of 800 pounds at various pressures has been calculated and plotted in Figure 15. If the pressure is decreased by enlarging the area of the surface of contact, the available frictional force increases by approximately 58% as the pressure changes from 70 psi. to 20 psi.

The third variable to be considered is the physical or chemical properties of the rubber sample itself. Outstanding among these are the polymer used and the hardness of the cured rubber. If different polymers are compounded into the same formula and cured to the same degree of hardness, differences in their friction are observed. Figure 16 illustrates this point for four widely differing polymers.

The matter of hardness is also of considerable importance. The spread between two samples made using the same polymer, but having considerably different hardnesses, may be greater than that for samples made using different polymers, but having the same hardness. Figure 17 gives coefficient curves for four GR-S tread compounds in which hardness was systematically varied by increasing the carbon black content.

The importance of this factor may be realized by comparing this figure with that immediately preceding it, where the difference between the best polymer and the worst at a six-pound load is 31%. Here the difference between the softest compound and the hardest, using the same polymer, is 49%. General indications are that with a given polymer, stocks of similar hardness will have similar coefficients, regardless of the method used to vary the hardness.

Theory

The distinguishing feature of the friction developed by a body sliding on ice, in contrast to an ordinary solid, is the film of water formed between them. This fact has long been recognized and is the subject of considerable discussion by Bowden and Tabor (13).

The mechanism by which this water film is formed may be either pressure melting, friction melting, or a combination of both. When pressure is applied to the ice, its melting point is depressed; and if sufficient heat is supplied to the contacting object to raise its temperature to the new melting point of the ice, then melting occurs. However, the pressure necessary to bring about any appreciable lowering of the melting point is very great; in fact, a pressure of 590 atmospheres will repress the melting point only 5° C. Even conceding that contact occurs between asperities, and that the actual pressure is much greater than the apparent pressure, melting due to the pressure must be slight.

Melting due to the work against friction, for the moment leaving the exact meaning of the term undefined, is a more reasonable answer. If the coefficient of friction for a particular rubber against ice is measured or known, the heat generated by it in moving some fixed distance over the ice may be calculated from the following equation:

$$Q = \frac{kW1}{J}$$

where Q = heat generated in calories
k = coefficient of friction
W = normal load in dynes
1 = distance moved over ice in centimeters
J = Joule's constant, 4.18×10^7 ergs per calorie

By means of this equation the data used to plot Figure 13 may now be used to calculate the amounts of heat generated per revolution of the ice tray. Results are shown graphically in Figure 18. From these it may now

be seen why the coefficient decreases as the load increases. At all temperatures as the load is increased, more heat is generated; and consequently more ice is melted, producing a thicker film. This film acts as a lubricant; therefore, as it becomes thicker, the coefficient of friction becomes less.

The fact that this film exists at low temperatures may be demonstrated by stopping the ice before removing the tripod. The film of water freezes almost immediately, and the rubber is firmly welded to the ice. The bond is so firm that often a fairly large chip of ice will break loose from the surface when the rubber is forcibly removed.

As was shown in Figure 13, a maximum value of friction is reached at some low temperature; after which, as the temperature is further decreased, friction also decreases. It is believed that at the point where the maximum occurs, heat is being lost at a faster rate than it is being generated. The rubber is momentarily welded to the ice surface, but owing to the momentum of the system and elasticity of the rubber a force quickly builds up sufficient to break the weld and allow the sample to slip into the next weld position. This stick-slip action has also been observed between lubricated metal surfaces (14). Examination of the ice surface after a few revolutions of this nature reveals a definite stick-slip pattern. The decrease in friction at temperatures below the maximum is due to excessive vibration, which reduces intimate contact between the surfaces.

The stick-slip phenomenon gives a clue as to the fundamental nature of the friction involved. Before motion begins there will be some asperities bearing together with sufficient pressure to melt. As other asperities assume the load, the orignals refreeze, forming welded junctions. Mechanical interlocking of microscopic hills and valleys provides additional forces opposing tangential motion. When motion does begin, the welded junctions and mechanical interlocks are broken; the work is converted into heat. Ice melted by the heat quickly refreezes to form new junctions. This cycle keeps repeating as long as motion continues, forming the characteristic stick-slip pattern.

In addition to these forces there is a slight contribution from the viscosity of the water film within the temperature range where it exists. Only very rough calculations of its magnitude can be made, but it is probably small compared to the welding forces.

In the final analysis it may be said that friction of rubber against ice is due principally to welding and breaking of junctions, with a slight contribution from the viscosity of the water film existing between the sliding surfaces.

Conclusions

The friction of tread compounds on ice is affected to a great extent by the methods and conditions of measurement. As velocity of sliding is increased from zero to about two centimeters per second, there is an increase in friction, after which there is a gradual decrease with further increase in velocity. Static friction depends upon the length of time the sample is in stationary contact with the ice and is of little practical significance. Of the test variables studied temperature has the greatest influence. At the lowest temperatures used, —30 to —40° C., the coefficient was approximately double that usually observed slightly below the freezing point. Friction was also found to vary with pressure. An empirical equation of the form, $k=C_1-C_2 \log P$, was found to fit results in many cases. Minor differences were noted, resulting from changes in sample shape and surface treatment.

When testing conditions were held constant, it was found that several variables in the samples themselves affected the friction. The type of polymer used had a definite effect. Of about equal importance was hardness. In similar compounds the softer samples had higher coefficients of friction.

The unusual frictional characteristics of rubber sliding on ice may be explained by taking into account the water layer formed between the sliding surfaces. The melting of ice to form this water layer takes place because of the heat generated by the work done against friction. The friction itself is believed to be caused by alternate welding and breaking of junctions between surface asperities. Although the process is initiated in part by pressure melting, that phenomenon only minor importance after the motion is in progress.

Acknowledgment

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Type 'L' Rotary Joint

THE availability of the Type "L" Johnson rotary pressure joint in all sizes of the standard Johnson joint has been announced by Johnson Corp., Three Rivers, Mich. The joints are used to introduce steam or other liquids under pressure into the rotating parts of a machine. They have reportedly been used with success in the rubber and plastics industry.

The Type "L" is a modification of the standard Johnson joint especially developed to facilitate proper mounting of the unit. It is built with lugs cast to the body for use in supporting the joint by means of simple rods. This construction, it is explained, permits the weight of the joint proper and its steam condensate to be removed from the sealing mechanism. The entire assembly is "floated" within the housing and thus permits full advantage to be taken of the lateral flexibility provided in the joints.

1954 Plastics Exposition

THE Sixth National Plastics Exposition, sponsored by Society of Plastics Industry, Inc., will be held the week of June 6, 1954, at the Cleveland Auditorium in Cleveland, O. All branches of the plastic industry are expected to participate in the exposition, which will be open to representatives of business, industry, and the military, but will be closed to the public. Harry Grunnagle, Westinghouse Electric Corp., will serve as chairman of the exposition committee for the second time.

Recent Developments in Rubber Calenders

Norman J. Elder[1]

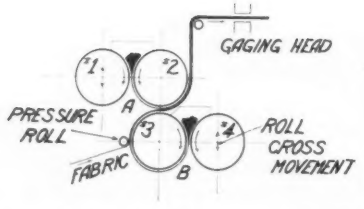


Fig. 1. Outline of Roll Arrangement, Position of Stock Banks and Their Separating Forces, Roll Cross Movement, and Flow Sheet for Double-Coating Tire Cord

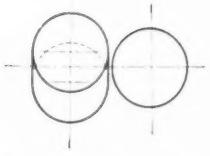


Fig. 1B. Roll Crossing, Schematic Diagram (Exaggerated)

INCREASING competition in the tire manufacturing industry continues the pressure for improved quality standards. A very important factor in connection with tire weight and tire balance is the accuracy of the calender equipment used in coating tire cord. This factor has received more emphasis lately, since for many tire sizes it is felt that a lighter-weight tire may be a better tire.

The calendering equipment replacement and modernization program, after having been dormant in the rubber industry for many years, is now gathering momentum. Precision equipment is being purchased for expansion programs, to be sure, but several new units are going into production to replace obsolete equipment.

In general, specifications and tolerances for the rubber coating on tire cord have been established realistically, taking into account the condition of the calendering equipment on which the coating is done. In many cases the only criterion of the quality and uniformity of the coating on the cord is the weight of the roll of coated fabric. Wide variations occur in the amount of rubber deposited on different parts of the fabric due to calender roll temperature changes, crown irregularities, speed fluctuation, and other factors. These variations, which in the past have been difficult to control, have led to the general adoption of specifications which call for calendering an excess of rubber on to the fabric.

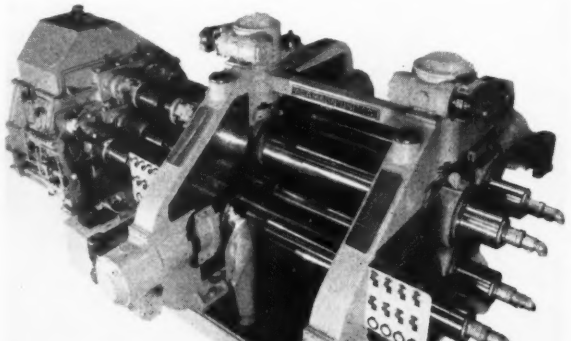
It has been estimated that from one ounce to three ounces of rubber compound can be eliminated from the carcass weight of most sizes of passenger-car tires, if full advantage is taken of the modern precision calendering and accessory equipment now available. Also, it may be that the lighter-weight tire thus made possible will be a better tire because of the smaller amount of heat built up by the thinner plies. The tire will be better balanced certainly, since the weight variation from yard to yard of coated fabric will be significantly reduced.

It can be shown that reducing the thickness of rubber coating on each side of tire fabric by only 0.0005-inch will save enough in two years or less to pay for the cost of a modern precision calender. The features available on these precision calenders permit the tire development department to reduce the specifications for the amount of rubber to be deposited on the fabric since the calenders will maintain the thickness of the rubber coating within very narrow limits hour after hour.

The older calenders used in the past were subject to many variables during operation, not only because of clearances in the bearings and variations in feed, but also because of wide fluctuations of temperature on the roll surfaces. The chamber bored roll on the older calenders, when used with hand-operated types of temperature control equipment, varied considerably in surface temperature, and also its crown changed appreciably during operation. Certainly it is to be expected that the specifications for the thickness and variation of the rubber on the tire fabric can be reduced with the modern precision calendering equipment used.

Advantages of the Zee-Type Calender

In double-coating tire fabric or in producing rubber thread, the Zee-type calender offers several advantages over the conventional inverted L unit. It will be seen in Figure 1 that large separating forces are imposed on the rolls by the two major banks of rubber compound during the operation of the Zee-type calender. There is a large bank of rubber between the #1 and #2 rolls and also between the #3 and #4 rolls. At the same time the laminating pressure between the #2 and #3 rolls is comparatively small in contrast to the major separating forces in the large banks. With the Zee-type arrangement of rolls, the major deflections of the rolls occur in the horizontal planes. Changes in operating conditions, that is, bank size, stock temperature, etc., will have their effect in changing the amount of deflection of the rolls, but with the Zee arrangement the effect of variable deflection is minimized. Also, the deflection of the #2 and #3 rolls does not appreciably affect the opening between these



28" x 78" Four-Roll Z-Type Calender with Separate Pinion Stand Drive

Fig. 2. Modern Four-Roll Zee-Type Calender with Separate Pinion Stand Drive

[1] Adamson-United Co., Akron, O.

rolls. This effect is in contrast to the situation which develops when the inverted L-type calender is in operation where the #3 roll deflects in the vertical plane, thus introducing more variation into the gage of the final product.

It will be seen also that it is considerably easier to feed the Zee-type calender since both feed banks are horizontally disposed. The problem of supplying the lower bank can be solved easily by use of automatic feeding devices, which would be somewhat more difficult to accomplish with the inverted L unit.

The Use of Roll Crossing Equipment

On calenders used in the rubber industry, the roll crossing or cross-axis device seems to be the best system yet devised for compensating for the deflection of calender rolls during operation. With the Zee-type calender (see Figure 1) the two offset rolls (#1 and #4) are crossed or skewed in the vertical plane. On the #1 roll, for example, the nearer roll box can be raised as much as one inch by a motorized adjusting device, while at the same time, the far end of the same roll will be lowered an equivalent amount. (See Figure 1B.) Thus the surfaces of the two rolls are farther apart at the ends than in the center, and by crossing the rolls a crown has been added. The amount of crown correction obtained is a function of the degree of crossing.

Present practice in calender manufacture involves grinding a small amount of crown on rolls #1 and #4 to suit the minimum requirement. Crown is then "added" during operation, as needed, so that flat sheets are produced at points A and B of Figure 1. This crossing of the roll axes is accomplished merely by pushing a button, and accurate indicators are provided to show the exact position in the vertical plane of the roll boxes.

The new precision calender units solve the problems of crown and temperature control, two of the major bugaboos which have always plagued calender operators in the past. The modern Zee-type calender shown in Figure 2 is equipped with peripherally drilled rolls and uses a pressurized circulating water temperature control system for these rolls. The crown can be changed during operation by crossing the rolls, and significant improvements have been made in main bearing design, pullback equipment, pinion stand drive, lubrication systems, and other components, all of which provide for more consistent calender operation.

Peripherally Drilled *vs.* Chambered Rolls

The peripherally drilled type of roll, which incorporates a series of longitudinal passages located as close as practicable to the surface, has displaced the chambered, internally bored roll for most new calenders used in the plastics industry. At the present time this improved-type roll is being used increasingly in calenders in operation in the rubber industry, both in new installations and as a replacement for bored rolls in existing machines.

With the drilled roll, the heating or cooling medium circulates near the surface, which action greatly increases the rate of heat transfer. In addition, the area of metal in contact with the fluid heating or cooling medium is considerably greater than with the chambered roll. One case is on record where a plastics calender equipped with drilled rolls and using a circulating water system was able to reach a temperature of 320° F. in 30 minutes. While such rapid temperature rise of the rolls is not recommended, it certainly demonstrates that high heat transfer rate may be obtained with this type of roll.

The drilled-type roll permits the maintenance of a much more accurate temperature control over its entire surface than can be attained with the chambered roll. It can normally be expected that a well-designed system will maintain the surface temperature of drilled rolls with a total variation of 5° F., or less, on areas subjected to similar conditions of operation. In other words, the surface in contact with the material being processed will be quite uniform, although area of the roll outside the guides might vary somewhate more in temperature.

Temperature Control Systems

Most new calender installations today for either the rubber or plastics industry incorporate drilled rolls in combination with a circulating hot-water system. Hot-water systems have been built for controlling roll temperatures up to 350° F., or higher, and a great many of these systems are in operation. One or more pumps are used in the system to obtain a flow of as much as 150 gallons per minute per roll. A pressure of about 200 psi. keeps the water from flashing into steam. Normally the temperature of the outlet water from the roll is controlled at some predetermined value, and this control can be done very accurately. For a given outlet water temperature, the roll surface temperature will be established by such operating conditions as speed, formulation, gage, etc. During the warm-up period, considerable heat must be supplied to the calender rolls, which means that the temperature of the circulating water will be higher than that of the roll surface. After normal operating conditions are obtained, however, considerable heat must be removed from the rolls. The temperature differential between the roll surface and the outlet water will therefore depend on the amount of frictional heat being imparted to the rolls by the working of the stock.

On the newer Zee-type calenders, designed for double-coating tire fabric at speeds of 80 to 100 yards a minute, motor horsepower requirements up to about 300 have been encountered. This horsepower input represents a great deal of heat, most of which must be removed from the rolls by the temperature control system. Considerable development work has been done by the manufacturers of temperature control equipment in the past five years, particularly on systems for use with plastics calenders. The control equipment has been simplified and improved, and, at the same time, the cost has been decreased. Most new calender installations should be equipped with modern circulating water systems, and significant improvement in the operation of older units can be obtained by the use of such equipment. These systems, when used with drilled rolls particularly, minimize the problem of the control of roll surface temperatures and thus free the calender operator to concentrate on obtaining improved quality of the finished product.

Pinion Stand Drive Details

The roll crossing calender, as built in this country, is equipped with a separate gear stand for driving the rolls individually. The direct current motor is coupled directly to the input shaft, driving the #3 roll (usually) through a double reduction bullgear and pinion set. Even-speed gears are provided #2 and #3 rolls, with gears to provide a speed or friction ratio for the two offset rolls. All gears are mounted in a fabricated case, where they operate on fixed centers under ideal conditions of lubrication and cleanliness. This construction is illustrated in Figure 3.

Rolls are driven from the gear stand by universal couplings or spindles, which allow for the misalinement that occurs when rolls are adjusted or crossed. Spindles may be of the bronze slipper type, such as were used on

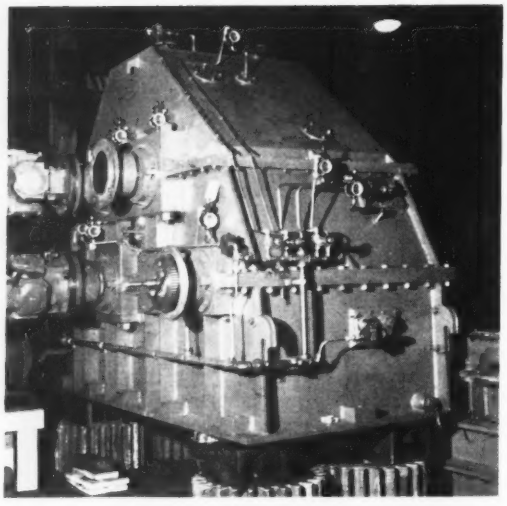


Fig. 3. Close-up of Separate Pinion Stand Drive

the older precision calenders, or of the improved roller bearing type used on more recent designs.

Main Bearings and Pullback Equipment

Most modern calenders are equipped with pullback devices for the main roll bearings. On calenders with journal or sleeve-type bearings, pullbacks or "zero clearance" units are provided to remove normal bearing clearance and hold the roll in its normal operating position at all times. These units consist of relatively narrow auxiliary bearings, mounted alongside the main bearings, preloaded into their normal operating position by means of springs or hydraulic pistons. These devices also serve the purpose of removing clearance from the screwdown mechanism. Construction is shown in Figure 4.

When the calender is equipped with roller bearings in place of the standard sleeve liners, clearance can be removed by shimming the bearing so that its radical clearance will be zero under normal operating conditions. The roller bearing, while expensive, is felt to have a longer service life with less maintenance. Also, since the bearing journal is not subject to wear, the problem of journal eccentricity is reduced.

Gaging Equipment

The new types of Beta Ray gaging equipment reveal the greater rubber coating or calendering gage variation obtained when the older-type calenders are used. With these new gaging devices, the effects of temperature variation of the roll surfaces, roll eccentricity, bearing clearance, feed variations of all sorts, and compound changes can be clearly observed. If the calender is stopped for a short time (which should be avoided, of course), when operation is resumed, the Beta Ray gage will indicate that the rolls have gone out of round because of temperature differentials, and this eccentricity may persist at times for an hour or more.

In addition to devices for measuring the final gage of the calendered product, development work has been done on units of the back-scattering type for use with four-roll double-coating calenders. These gages are intended for use in reading the thickness of the two rubber sheets before they are laminated to the tire fabric. A third gage of the conventional type reads the total thickness of the double-coated tire cord.

Some work has been done on automatic control of the calender screwdown equipment by use of Beta Ray devices. At the present time, however, this work must be regarded as being in the developmental stage.

Automatic Stock Feeding Devices

One vital factor in gage uniformity is the uniformity of the stock feed to the two major calender banks. On the newer installations it is common practice to install strip feeding equipment to bring the warmed stock from the sheeting mill to the calender. These units can provide either a wigwag head, or a single or double stationary strip, so located as to feed the roll bank as uniformly as possible. The objective is to keep the bank small and evenly agitated in order to avoid changes in separating force as the material is calendered. Changes in the size of the bank and temperature differentials in the stock bank will cause variable deflection of the calender rolls, which, in turn, affect the finished gage of the double-coated tire cord.

Lubrication System

All precision calenders are equipped with a complete circulating oil system, including pump, tank, filter, cooler, heat exchanger, alarm system, and other necessary components. Boxes and seals are of advanced design, and metal labyrinth-type seals eliminate leakage problems encountered with older-type seals. With this system, metered amounts of temperature conditioned oil are fed to the bearings, and thermometers are provided to read the temperature of the return oil from each main bearing and each pullback bearing.

Summary and Conclusions

There has been an increasing trend in the past few years toward the installation of new precision calenders in the rubber industry. This new equipment is of particular value for high-speed production, particularly in the double-coating of tire cord. There is considerable interest also in three-roll universal calenders, incorporating roll crossing, drilled rolls, and other features similar to those which are available on the precision Zee-type unit.

Most people concerned with calendering operations in the tire manufacturing business will agree that installation of this new type of precision equipment is very desirable and beneficial. What is required is a study of the economics of each individual case to determine the best time to install the new equipment.

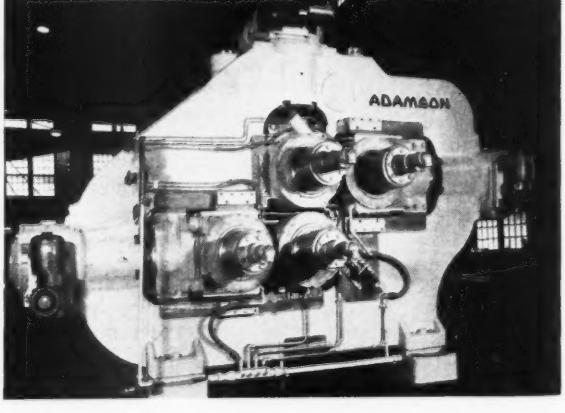


Fig. 4. Side View 28-Inch by 78-Inch Four-Roll Zee-Type Calender Showing Main and Pullback Bearings

Oil Resistance of Nitrile Rubber[1]

N. G. Duke[2] and W. A. Mitchell[2]

IN THE United States of America a nitrile rubber is defined as a copolymer of a diene and an unsaturated nitrile. In this paper the discussion will be limited to copolymers of butadiene and acrylonitrile, since the nitrile rubbers today available to the rubber compounder are made by copolymerization of these two monomers.

Butadiene has a molecular weight of 54; it is an unsaturated hydrocarbon with a 4-carbon chain having a pair of conjugated double bonds. Acrylonitrile has a molecular weight of 53. The empirical formula is C_3H_3N, but we think of it as a 2-carbon chain with a double bond, in which the cyanide group CN has been substituted for one hydrogen atom. Thus acrylonitrile is a vinyl monomer, sometimes called vinyl cyanide.

Since the molecular weights of these two monomers are nearly equal, their proportions by weight are practically the same as their molar proportions. When we say that a nitrile rubber has a butadiene-acrylonitrile ratio of 2:1, we mean proportions either by weight or by number of molecules.

Oil resistance is the most important property of nitrile rubbers and is the reason for their extensive use even when they cost substantially more than natural rubber or general-purpose synthetic rubbers. By oil resistance we mean the ability of the vulcanized product to retain its original physical properties, such as modulus, tensile strength, abrasion resistance, and dimensions, while in contact with oils or fuels.

Compounding and processing are important factors, but the proportion of acrylonitrile in the copolymer, and the chemical nature of the oil or fuel are the primary factors which determine the oil resistance of a nitrile rubber vulcanizate.

The properties of the nitrile rubbers were investigated in Germany (1),[3] where they were first produced commercially. I. G. Farbenindustrie produced one nitrile rubber with medium acrylonitrile content, and another with extra acrylonitrile for use where higher oil resistance was required. All commercial producers have followed this practice of producing two or more nitrile rubbers with different proportions of acrylonitrile.

The first production of nitrile rubber in the United States came in 1938 when The B. F. Goodrich Co. began operating a pilot-plant in Akron, O. Several private companies entered the field between the beginning of World War II in 1939 and the entry of the United States into the war in 1941. Large-scale demand for nitrile rubber was created by the war, and the industry expanded very rapidly. Its postwar growth has been steady and based largely upon diversification of end-uses.

Scope of This Article

Data and charts are presented to show the effects of various factors on the oil resistance of nitrile rubbers.

Factors investigated include the use of softeners and pigments and the modulus value and state of cure, which are controlled by the rubber compounder, and the degree of cross-linking, polymerization temperature, acrylonitrile content, and homogeneity of the polymer, which are controlled by the manufacturer of the polymer.

Volume change after immersion in test oils and fuels is used as a measure of oil resistance because this measurement can be made accurately in the laboratory and has been proved by experience to be very useful in predicting the serviceability of commercial products.

The experiments were run in the sales service laboratory of B. F. Goodrich Chemical Co. Some of the data have been published previously in technical bulletins and the Hycar Technical Manual (2).

Previous Investigations

In 1940, Carman, Powers, and Robinson (3) reported results of immersion tests of synthetic rubber compounds, including two nitrile rubbers, and pointed out a relation between the % volume increase of the vulcanizate and the aniline point of the mineral oil; in general, the logarithm of the % swell varied inversely with the cloud temperature of a mixture of equal parts of aniline and the oil. Hanson (4) found the same relation for hydraulic oils used in recoil mechanisms.

Garvey, Juve, and Sauser (5) found that the extent of swelling of a high nitrile rubber in oils is lessened by pigment loading, and that by the use of extractable softeners it is possible to compound stocks either to shrink or swell to a moderate extent, or to show almost no change in volume in mineral oils. Juve and Garvey (6) showed that the change in volume of compounds of a high nitrile rubber depends on the temperature of immersion, the softener in the compound, and the shape of the test specimen.

Fraser (7) found that with kerosenes and gasolines having American Petroleum Institute gravities above 40, the Diesel index was more precise than the aniline point in predicting the swelling power of fuels on neoprene vulcanizates.

$$\text{Diesel index} = \frac{\text{API gravity} \times \text{aniline point °F.}}{100}$$

$$\text{API gravity} = \frac{141.5}{\text{specific gravity}} - 131.5$$

Powers and Billmeyer (8) measured the swelling of four oil-resistant synthetic rubber compounds in mineral oils at various temperatures. They compounded Neoprene GN, Stanco Perbunan, Hycar OR-15, and Thiokol FA without softeners. Below 100% swelling, the relation between the logarithm of the % volume increase and the aniline point of the oil was approximately linear. The position of the approximately linear portion of each swelling curve varied with the immersion temperature, but the slope was found to be characteristic of each synthetic rubber, and was apparently not affected by immersion temperature, loading, or degree of cure. The following linear equations were suggested as first approximations of this relation:

Neoprene GN $\qquad \text{Log } S = 2.75 + \frac{t}{146} - \frac{\text{A. Pt.}}{50}$

[1] Presented by W. A. Mitchell at the fall meeting of the Swedish Institution of Rubber Technology, Stockholm, Sweden, Nov. 14, 1952; and by N. G. Duke before the Washington Rubber Group, Washington, D. C., Nov. 19, 1952.

[2] B. F. Goodrich Chemical Co., Cleveland, O.

[3] Figures in parentheses refer to Bibliography items at end of this article.

Perbunan (Stanco) $\text{Log } S = 2.10 + \frac{t}{182} - \frac{\text{A. Pt.}}{58}$

Hycar OR-15 $\text{Log } S = 1.40 + \frac{t}{125} - \frac{\text{A. Pt.}}{58}$

Thiokol FA $\text{Log } S = 1.18 \pm \frac{t}{113} - \frac{\text{A. Pt.}}{60}$

where S = % volume increase
t = temperature of immersion, °C.

For each of the two nitrile rubbers a 58° C. decrease in aniline point of the oil gave a tenfold increase in the swelling.

Howlett (9) studied the volume increase of a series of compounds of three nitrile rubbers in ASTM standard lubricating oils and standard reference fuels. He constructed two graphs to be used with constants of swell and extraction, to predict the swelling of compounds according to the amount of loading and the amount of extractability of softeners in the compound.

Rostler and Morrison (10) stated that a reinforcing filler such as carbon black reduces the swelling of a rubber compound more than can be accounted for by dilution of the rubber content, and they found that swelling figures vary between compounds loaded with the same volume of different carbon blacks.

Sarbach and Garvey (11) studied the solubilities of unvulcanized rubbers in more than 100 solvents and found a qualitative relation between the solubility of a raw polymer and the swelling of its vulcanizates.

Theoretical

Whitby, Evans, and Pasternack (12) at McGill University pointed out the similarity of structure between rubber and swelling media as an explanation for the swelling behavior of natural rubber. Rostler and White (13) at the University of Delaware compared the swelling of vulcanized natural rubber and synthetic rubbers in organic liquids and showed that similarity in structure between any rubber and organic liquid governs the swelling, in the same manner that similarity in structure governs the qualitative rules for predicting the solubility of organic compounds.

Among the types of rubber they studied, butyl rubber, essentially a saturated aliphatic hydrocarbon, shows the most swelling in heptane. GR-S swells more than other rubbers in benzene. Natural rubber swells more than other rubbers in a reclaiming oil which is a mixture of unsaturated cylic compounds. The oil-resistant rubbers, which have polar groups in their molecules, swell more in polar liquids than do natural rubber, GR-S, and butyl rubber, which are non-polar hydrocarbons. Aniline, a polar aromatic liquid, swells nitrile rubbers much more than any of the other rubbers except Thiokol, with which it appears to react chemically. This point explains why the aniline point of an oil, which is a measure of the solubility of the oil in aniline, correlates with the swelling effect of the oil on nitrile rubber, which has structural similarity to aniline.

Salomon and others (14) at the Rubber Foundation, Delft, Netherlands, conducted a series of fundamental investigations on the properties of rubber-like high polymers and on the influence of structure on polymer-liquid interaction. These investigators studied the influence of nitrile groups on the properties of a series of copolymers of butadiene, dimethylbutadiene, and isoprene with varying proportions of acrylonitrile, and on the swelling of these copolymers by a series of solvents of gradually changing geometrical and chemical structure. They interpreted the gradually increasing density with increasing acrylonitrile content as an indication of the strong intermolecular forces exerted by nitrile groups. These authors also emphasized the influence of polarizability and polarity on the swelling equilibria and discussed their results in relation to the theory that the swelling of a polymer is caused primarily by a gain in entropy. In their observations on the oil resistance of the three series of nitrile rubbers, they could not find any influence of the varying degrees of cross-linking, and they concluded that the swelling equilibrium is determined only by the number of nitrile groups in the polymer.

Experimental Procedure

Nitrile rubber differs from natural rubber in three important respects which must be taken into consideration in the compounding procedure. Many of the failures to achieve uniform good results in nitrile rubber compounding may be traced to one of these three factors; consequently careful attention has been given to them in laboratory compounding practice.

1. Nitrile rubber does not break down so readily as natural rubber. The former should be broken down by passing through a cool tight mill at least six times.

2. Sulfur is much less soluble in nitrile rubber than in natural rubber; consequently good dispersion is essential. Either finely divided sulfur or a previously dispersed sulfur masterbatch is added immediately after the zinc oxide. The accelerator and the organic acid activator are added last.

3. Nitrile rubber does not crystallize when stretched and, consequently, is not self-reinforcing. Reinforcing pigments are needed to develop optimum physical properties and must be well dispersed.

The laboratory batches were mixed on a six-inch by 16-inch mill, using generally accepted practices as described in our Standard Testing Procedure #31, which is available upon request. Vulcanizates were prepared according to ASTM Procedure D15-50T (15). Tension testing was performed in accordance with ASTM Procedure D-412-49T (15). The immersions were run using ASTM Procedure D-471-51T (15). The immersions in the ASTM oils were for 70 hours at 100° C. and in the reference fuels for 70 hours at room temperature (25° C. ± 3° C.). Volume change was determined by the hydrostatic or water displacement method and is expressed as the % increase or decrease from the orignal volume. The terms swelling and shrinkage are sometimes used to express volume increase and decrease.

The aniline points of the test oils and fuels were as follows:

	ASTM Oils — No.			Fuels	
	1	2	3	SR-10	SR-6
Aniline point, °C.	124	93	70	45	0

Low-temperature flexibility was measured by the Gehman freeze test in accordance with ASTM Procedure No. D1053-49T (15). This test evaluates stiffening at low temperatures by measuring torsional modulus. T5 is the temperature at which the sample is five times as stiff as at room temperature; T10, 10 times; and T100, 100 times.

Discussion of Results

Effect of Pigmentation

Figure 1 shows the effect of increasing proportions of three types of carbon black on the swelling of a typical

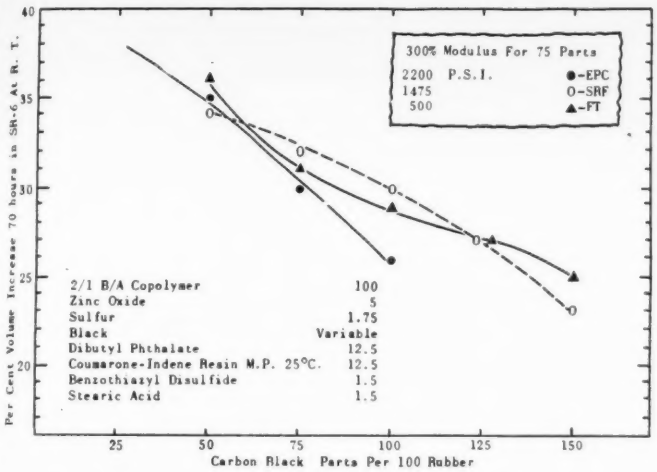


Fig. 1. Effect of Varying Proportions of Three Carbon Blacks on Nitrile Rubber Swelling

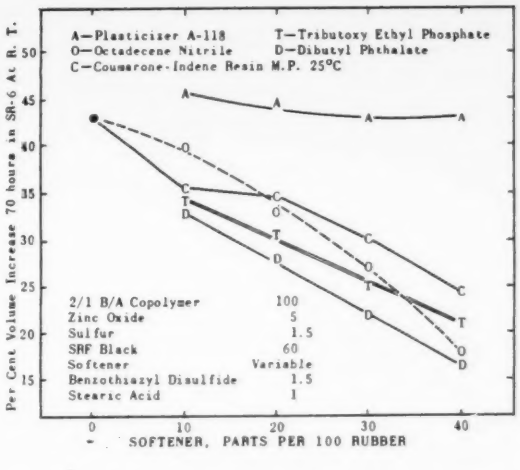


Fig. 2. Effect of Varying Amounts of Five Softeners on Nitrile Rubber Containing 60 Parts of SRF Carbon Black

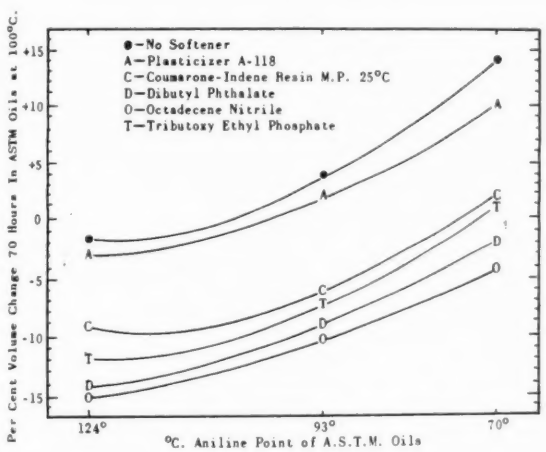

●—No Softener
A—Plasticizer A-118
C—Coumarone-Indene Resin M.P. 25°C
D—Dibutyl Phthalate
O—Octadecene Nitrile
T—Tributoxy Ethyl Phosphate
Per Cent Volume Change 70 Hours In ASTM Oils at 100°C.
°C. Aniline Point of A.S.T.M. Oils

Fig. 3. Effect of 30 Parts of Three ASTM Oils on Nitrile Rubber with and without Softeners

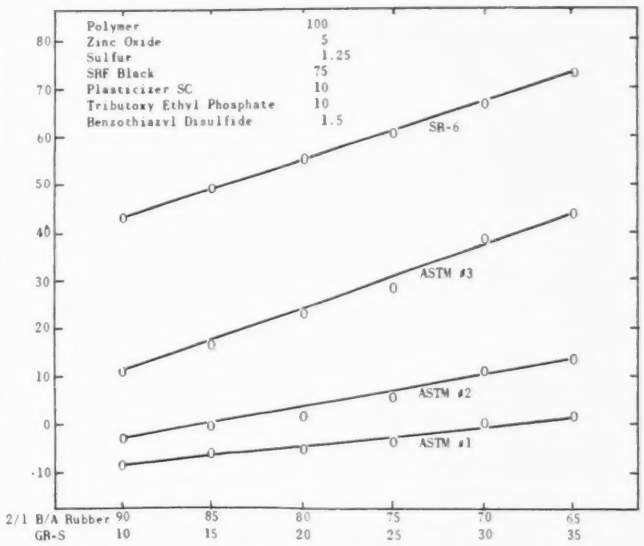


Fig. 4. % Swell *versus* Nitrile/GR-S Blends

compound of a 2/1 B/A copolymer in SR-6 fuel. The three types of carbon black all have the same specific gravity: namely, 1.82. These three carbon blacks show very little difference in their effect on the swelling of the vulcanizate. The slopes of the curves are largely due to the dilution of the polymer by the pigment.

Effect of Modulus

The three series of compounds used in Figure 1 show widely different moduli at 300% elongation. This point indicates that the increase of modulus due to the reinforcing effect of structure blacks does not have any appreciable effect on the resistance of this compound to swelling in an aromatic fuel.

Effect of Softeners

Figure 2 shows the effects of 10, 20, 30, and 40 parts of five softeners on a similar compound containing 60 parts of SRF black. This compound with no softener swells 43% in SR-6. With 10 parts of two ester-type softeners: namely, tributoxy ethyl phosphate and dibutyl phthalate, the swellings drop off to 34 and 33%, and then continue to drop through 20, 30, and 40 parts with a slope steeper than would be accounted for by dilution of the polymer. This action is due to extraction of these softeners. A coumarone-indene resin, with a melting point of 25° C. (Cumar P-25) drops to 36% at 10 parts and then falls off with a more gentle slope, indicating that this softener resists extraction by the aromatic fuel.

In contrast to dibutyl phthalate, the softener octadecene nitrile shows a swell of 39% at 10 parts; whereas the phthalate ester shows 33% at this level. The difference in the effect of ODN at 10 parts may be due to the affinity of the nitrile group in the softener for the nitrile group in the polymer. At 40 parts ODN shows almost the same amount of extraction as dibutyl phthalate.

Plasticizer A-118 is the condensation product of a polyhydric alcohol with an alpha-omega dicarboxylic acid. The compounds containing this polymeric softener shows the same % swell at 30 and 40 parts as does the compound with no softener: namely, 43%. This result shows that A-118 softener is not only non-extractable, but that it swells approximately the same amount as the nitrile rubber. If it did not swell, its curve should slope off in accordance with the amount of dilution of the rubber polymer by the softener.

Figure 3 shows the effects of immersion in the three ASTM oils of the same compound with no softener and

with 30 parts of the same five softeners. The % volume change is charted against the aniline point of the oil. With respect to extractable softeners, the aniline point of the oil in which the vulcanizate is immersed has a greater effect on the swelling than does the choice of the softener.

Detailed data on the effects of various softeners on nitrile rubber vulcanizates are given in the "Hycar Softener Study" (16).

Blending with GR-S

Nitrile rubber has poor compatibility with natural *Hevea* rubber, but with butadiene-styrene (GR-S) rubber it can be blended successfully in all proportions. Blending with GR-S is a common commercial practice for the sake of economy when a product requires only moderate oil resistance, and low-temperature flexibility is not important. GR-S may also be used to counteract shrinkage by softener extraction when a tight seal for an oil with a high aniline point is desired.

Figure 4 shows the volume changes of blends of a 2/1 B/A nitrile rubber with GR-S, in proportions from 90/10 to 65/35. The swelling increases as the proportion of butadiene-styrene rubber increases, but in the aliphatic mineral oil No. 1, nearly 30% of GR-S is required to offset the shrinkage caused by the extraction of the 20 parts of ester-type softeners.

State of Cure

TABLE 1. EFFECT OF STATE OF CURE ON VOLUME SWELL OF NITRILE RUBBERS

Compound	1	2
2/1 B/A copolymer	100.0	—
4/1 B/A copolymer	—	100.0
Zinc oxide	5.0	5.0
MAF black	40.0	40.0
Tetramethyl thiuram disulfide	3.5	3.5
Stearic acid	1.0	1.0
	149.5	149.5

T = Ultimate tensile
E = Ultimate elongation
M = 300% Modulus psi.

Compound 1 Cure@270° F. (132° C.) Min.	T	E	M	% Volume Change 70 Hrs. @ 212° F. (100° C.) in ASTM Oils No. 1	2	3	70 Hrs. @ R. T. in SR-10	SR-6
0	150	1100	—	−0.8	6.2	17	6.3	64
5	390	945	—	0.7	7.7	18	7.5	61
10	1030	555	600	1.5	5.9	17	6.9	59
20	1690	480	1020	2.1	6.1	18	7.4	59
40	2760	445	1680	2.9	6.4	17	7.4	57
80	2970	420	1950	3.0	6.6	18	6.8	54
160	3120	410	2080	2.1	7.9	17	7.1	56
Cure@310° F. (155° C.) Min.								
30	2920	410	2030	2.3	6.7	17	6.7	57
Compound 2 Cure@270° F. Min.								
0	100	200	—	11	27	66	49	*
5	260	850	—	18	30	66	43	231
10	970	490	590	15	29	60	41	216
20	1460	450	940	13	30	59	41	153
40	2300	485	1280	14	28	54	39	131
80	2720	435	1670	10	27	52	38	123
160	2680	405	1790	7	28	51	38	121
Cure@310° F. (155° C.) Min.								
30	2560	410	1690	11	30	54	38	125

*Sample disintegrated.

To determine the effect of state of cure on the swelling of nitrile rubbers, immersion tests were run on a series of specimens ranging from the uncured stock at one extreme to a very tight cure on the other. A low curing temperature was used to prevent rapid vulcanization and thus give a better distribution between high and low states of cure. Table 1 shows results using 2/1 and 4/1 B/A copolymers. It can be seen that the effect is dependent upon both the type of polymer and the substance in which it is immersed. State of cure has very little effect on the swell of the more oil resistant rubber (2:1). In the SR-6, which is the highest swelling medium, the difference between the uncured and the tight cure is a decrease of only 8%. In all other media there is no significant difference between various states of cure. With the ASTM No. 1 oil there even appears to be a slight increase in swell as the cure progresses up to 80 minutes and then falls off again at longer times.

The 4:1 copolymer is definitely more sensitive to state of cure. The swell decreases as the degree of cure increases. In the SR-6 fuel this difference is as great as 100% swell between the five-minute cure and the 40-minute cure at 270° F. (132° C.). The 30-minute cures at 310° F. (155° C.) are included in the table for comparison since these are generally considered the optimum cure. It can be seen that this cure is in the range where modulus has leveled out and change in volume is nearing a minimum. Curing for longer periods at 310° F. would have very little effect on the volume change of the vulcanizate.

Since it has been pointed out earlier that modulus variations due to different types of loading had very little effect on volume swell, it should be noted here that wide modulus variations due to state of cure might show some correlation with volume change.

Factors Inherent in the Raw Polymer

Until now we have considered factors controlled by the compounder of a nitrile rubber. Now we come to some factors which are controlled by the manufacturer of the nitrile rubber.

Two factors which have no appreciable effect on the oil resistance of a nitrile rubber are the degree of cross-linking, or "gel content," and the temperature of polymerization. Table 2 shows the volume changes in the three ASTM oils of a standard compound without softener, based on three different nitrile rubbers, each having the same 2:1 ratio of butadiene to acrylonitrile. Polymer "H" is a regular easy-processing type with some cross-linking in the raw polymer chain. Polymer "C" is polymerized at low temperature, using refrigeration equipment. Polymer "S" is a soluble type, designed to have a minimum amount of cross-linking for convenience in the manufacture of cements. Their swelling characteristics are almost identical.

TABLE 2

Compound			% Volume Changes 70 Hrs. at 100° C. ASTM Oil No.		
Polymer	100		1	2	3
Zinc oxide	5				
Philblack A	40	Polymer			
Tetramethyl thiuram disulfide	3.5	"H"	−1	+6	+16
Stearic acid	1.0	"C"	−1	—	+17
	149.5	"S"	−2	+6	+16

Ratio of Butadiene to Acrylonitrile

The proportion of acrylonitrile in the copolymer is the most important factor affecting the oil resistance of its vulcanizates. Figure 5 shows the swelling in SR fuels at room temperature of four nitrile rubbers compounded (A) with softeners and (B) without any softener. The % volume increases are plotted against the ratios of butadiene to acrylonitrile, which range from less than 2:1 to about 4:1. Figure 6 is a similar plot of the swellings of these four copolymers in the three ASTM oils.

Figure 7 shows the same data as shown in Figure 6 plotted in a different manner. The % volume changes in ASTM oils are plotted against the aniline points of the three oils. Thus each curve represents the swelling behavior of one copolymer. The lowest curve represents the copolymer with the highest acrylonitrile content. As the aniline point of the oil decreases, the swelling effect

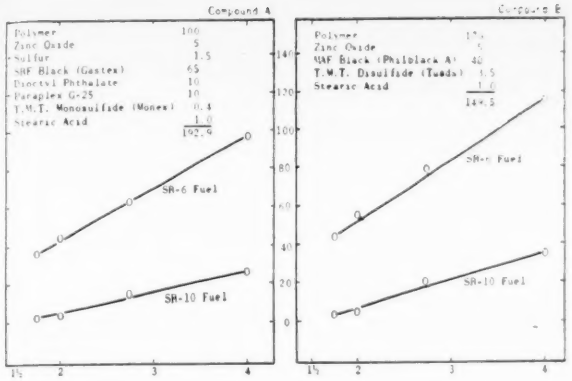


Fig. 5. % Swell in SR Fuels *versus* Butadiene/Acrylonitrile Ratio; A—Compounded with Softener; B—Compounded without Softener

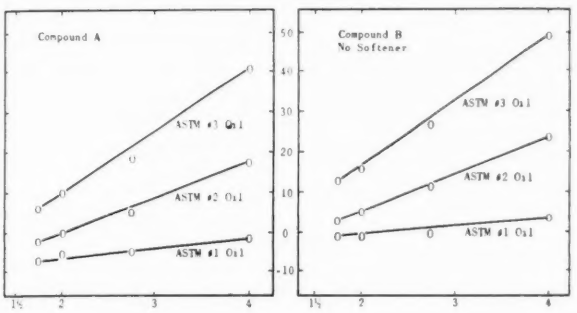


Fig. 6. % Swell in ASTM Oils *versus* Butadiene/Acrylonitrile Ratio; A—Contains Softener; B—No Softener

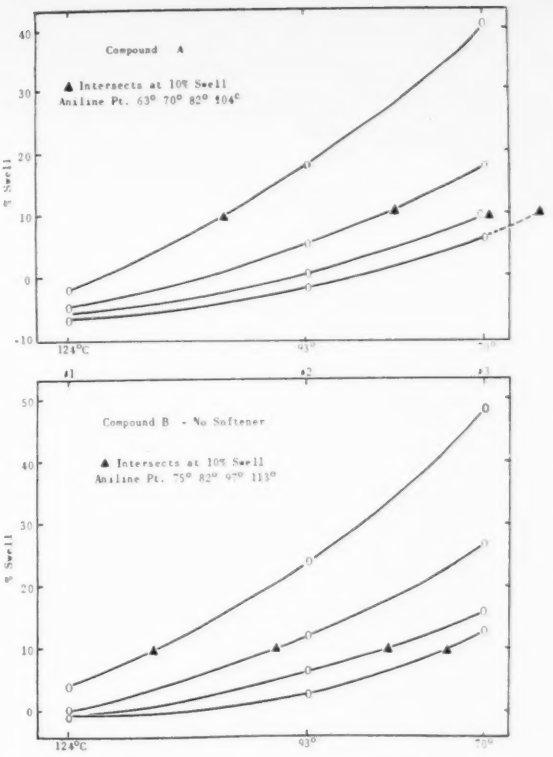


Fig. 7. % Swell in ASTM Oils *versus* Aniline Point; A—Contains Softener; B—No Softener

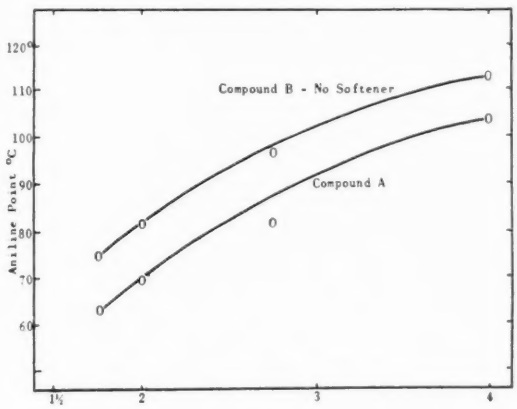


Fig. 8. Aniline Point of Oil to Swell Compound 10% *versus* Batadiene/Acrylonitrile Ratio of Copolymer

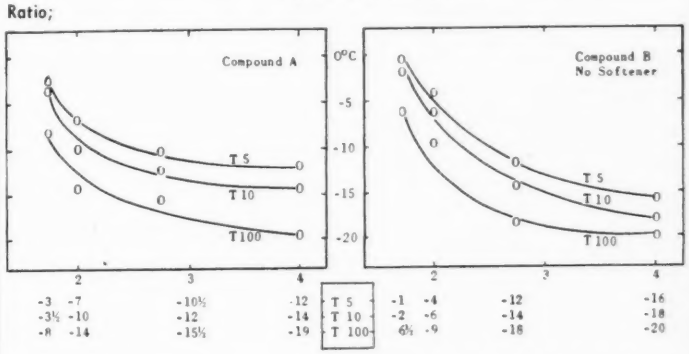


Fig. 9. C. Gehman Freeze Test *versus* Butadiene/Acrylonitrile Ratio of Copolymer

increases. The curve representing the copolymer with the lowest acrylonitrile content is not only in the highest position, but also has the steepest slope. From these curves we have determined graphically the intersects at the ordinate of 10% swell, or the aniline point of an oil which would effect a 10% swell in each of the four copolymers. These aniline points are recorded in the upper left corner of each chart.

Using the four aniline points determined graphically in Figure 7, we have drawn Figure 8, on which the aniline point of an oil which will effect a certain swell: namely, 10%, is plotted against B/A ratio. Connecting the points plotted for the B compounds, which contain no softener, gives a very smooth curve. This curve shows the relation between the two most important factors af-

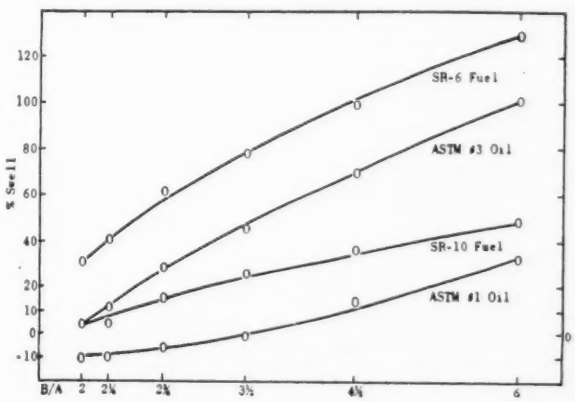
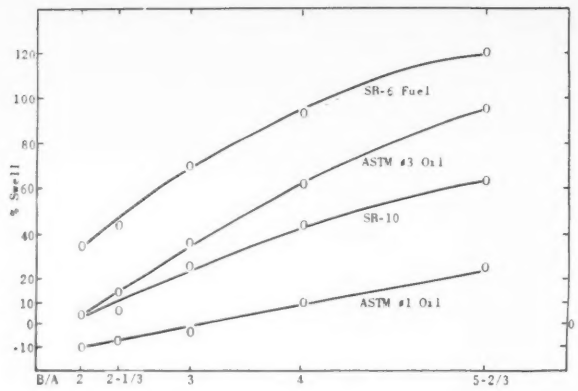


Fig. 10. % Volume Changes *versus* Butadiene/Acrylonitrile Ratio for Mixtures of 2/1 and 6/1 Copolymers after 70 Hours at Room Temperature in SR Fuels and at 121° C. in ASTM Oils



(Above)

Fig. 11. % Volume Changes *versus* Butadiene/Acrylonitrile Ratio for Mixtures of 2/1 Copolymer and Polybutadiene after 70 Hours at Room Temperature in SR Fuels and at 121° C. in ASTM Oils

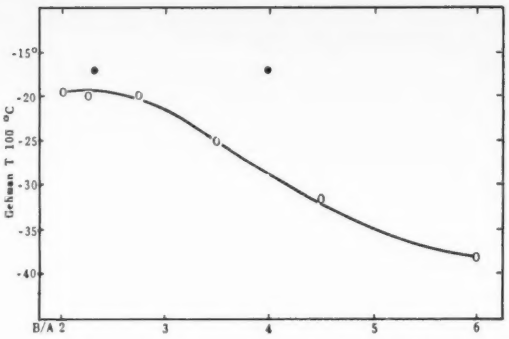
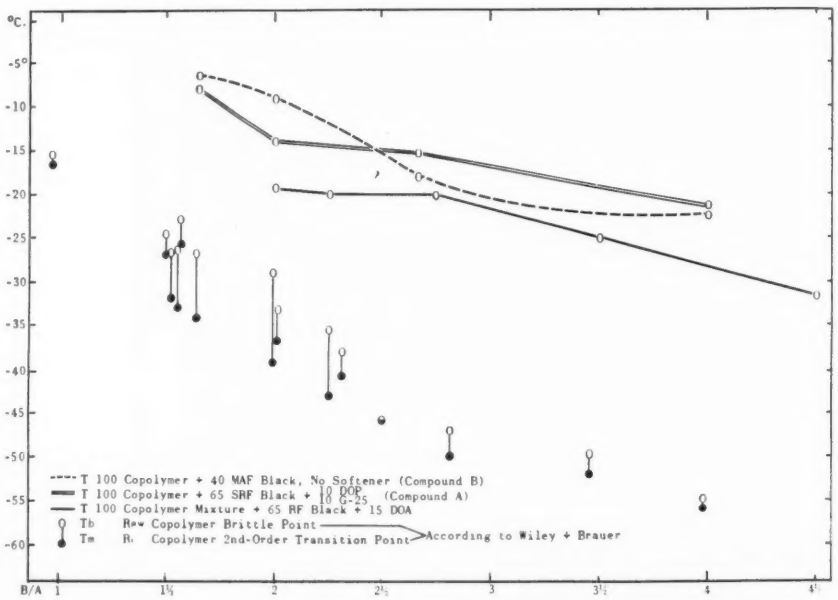


Fig. 13. Gehman T-100 *versus* Butadiene/Acrylonitrile Ratio of Nitrile Rubber

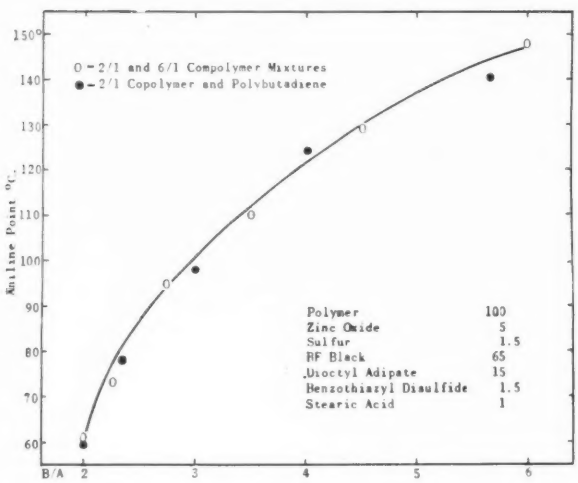
(Right)

Fig. 14. Brittle Points and Second-Order Transition Temperatures *versus* Butadiene Acrylonitrile Ratio of Nitrile Rubbers (Wiley and Brauer) and Duke and Mitchell Gehman T-100 Values


°C.
T 100 Copolymer + 40 MAF Black, No Softener (Compound B)
T 100 Copolymer + 65 SRF Black + 10 DOP + 10 G-25 (Compound A)
T 100 Copolymer Mixture + 65 RF Black + 15 DOA
Tb Raw Copolymer Brittle Point
Tm R. Copolymer 2nd-Order Transition Point
According to Wiley + Brauer
B/A 1 1½ 2 2½ 3 3½ 4

(Below)

Fig. 12. Aniline Point of Oil to Swell Compound 10% (70 Hours at 121° C.) *versus* Butadiene/Acrylonitrile Ratio of Nitrile Rubber



fecting the oil resistance of a nitrile rubber: namely, the acrylonitrile content of the rubber and the chemical nature of the oil.

As the acrylonitrile content and the oil resistance of a nitrile rubber increase, the low-temperature flexibility decreases. For some applications oil resistance must be sacrificed for the sake of low-temperature flexibility; therefore the latter is of interest to the compounder of oil-resistant products. Figure 9 shows the Gehman freeze test results for the same four copolymers used in Figures 5 through 8.

The correlation between oil resistance and acrylonitrile content holds true regardless of whether the acrylonitrile content is arrived at by direct copolymerization, or by mill-mixing blends of copolymers of different acrylonitrile contents. Figure 10 shows swelling results for a series of mixtures of a 2:1 copolymer and a 6:1 copolymer. Figure 11 shows similar data for a series of mixtures of the 2:1 copolymer and polybutadiene.

The polybutadiene used in this series was PBX-586, a masterbatch with 50 parts of RF or HAF carbon black (Philblack 0) prepared by Phillips Petroleum Co. The softener used in the two series of mixtures was 15 parts of dioctyl adipate (Good-rite GP-233), for the sake of low-temperature flexibility.

The aniline points of oils which would swell the various mixtures 10% were determined graphically, by the same method used for Figure 8. These are plotted against the B/A ratios of the mixtures in Figure 12. The points fall close to one fairly smooth curve similar to the curves in Figure 8.

These results would indicate that a lack of homogeneity in a nitrile rubber with respect to B/A ratio would not affect its oil resistance. The azeotropic ratio for the emulsion polymerization of butadiene and acrylonitrile is ap-

proximately 5:3, varying somewhat with the conditions of polymerization. If the charging ratio is different from the azeotropic ratio, there is a tendency to produce a mixture of copolymers of gradually changing monomer ratios. Analysis of the rubber will show the average acrylonitrile content, but will not reveal the extent of this type of heterogeneity, if any.

Low-Temperature Flexibility

The Gehman T 100 results for the mixtures of 2:1 and 6:1 copolymers are shown in Figure 13. In general, the low-temperature flexibility improves as the acrylonitrile content decreases.

Two points are also plotted in Figure 13 showing Gehman T 100 values for mixtures of the 2:1 copolymer and polybutadiene. At $2\frac{1}{3}$:1 and at 4:1 B/A ratio the Gehman T 100 is —17° C.; whereas for the 2:1 copolymer alone it is —19° C. These two points would seem to indicate that mixing with polybutadiene does not improve low-temperature flexibility. Test results on low-temperature flexibility, however, are comparatively difficult to duplicate; therefore no conclusions should be drawn from this one study without further investigation.

In an attempt to correlate our data on the low-temperature flexibility of vulcanizates with inherent physical properties of raw copolymers, we have plotted our Gehman T 100 results on the same chart with results obtained by Wiley and Brauer at the University of North Carolina (16). They determined the brittle points of 14 commercial nitrile rubbers, using the method described by Selker, Winspear, and Kemp (17). They also determined the second-order transition temperatures by the refractometric index method. These data are shown in Figure 14.

Conclusions

The oil resistance of a nitrile rubber compound depends primarily on the acrylonitrile content of the rubber. This general relation holds true for blends of nitrile rubbers with different acrylonitrile contents and blends of a nitrile rubber with polybutadiene.

The authors wish to thank Mrs. E. D. Flynn for obtaining many of the experimental data, and R. C. Bascom for his suggestions and encouragement.

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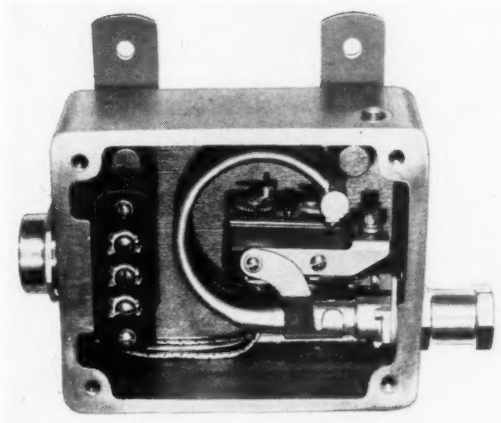
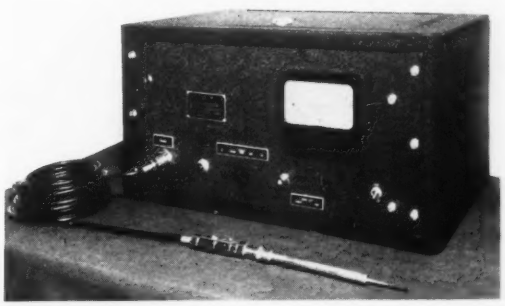


Meletron Model 314 Pressure Switch with Variable Actuation

New-Model Pressure Switch

A NEW-MODEL pressure switch, Meletron Model 314, which contains a variable actuation device, is available from Barksdale Valves, Los Angeles, Calif. The switch may be actuated at any predetermined pressure over an adjustable range of 10 to 2,000 psi., depending on which of the six available switch classes, 500, 1,500, 3,000, 4,500, 6,000, or 12,000 psi., is employed. Actuation of the switch at the desired value, which may be changed by an optional external adjustment, occurs by increased or decreased pressure and is automatically reset by snap action. Accurate sensing of system pressures over an adjustable range of 15-2,000 psi. is said to be another feature of the new model, which can perform in gas or liquid systems.

Skeleton switches (Model 304) with the same operating characteristics, but without a case, may also be had.



Bendix's Ultra-Viscoson Showing Probe and Electronic Computer

Viscosity Control Instrument

THE Ultra-Viscoson, an ultrasonic instrument which continuously measures, records, and controls viscosity of a fluid, has been acquired by Bendix Aircraft Corp., Teterboro, N. J., from its inventors, Stanley R. Rich and Wilfred Roth. The device consists of a thin alloy steel blade attached to the end of a small probe, which is designed for permanent installation and is connected to an electric computer and an automatic recording mechanism.

The steel blade is immersed into the fluid to be tested and is activated by pulses of a quantity of ultrasonic energy equivalent to one-millionth the power of a flashlight battery. The vibration of the blade is a function of the viscosity of the fluid into which it is immersed.

Instantaneous and continuous measurement and control of materials in pipes, reactors, or fractioning columns in high-pressure or vacuum systems over a range of —200 to +650° F. is claimed possible through its usage. Viscosity determination tests which require sample-taking and laboratory analysis may now be eliminated. Industrial use of the instrument by many large chemical firms is said to have proved successful.

Editorials

What Will Be the Future of Research on Synthetic Rubber?

THE present preoccupation with the formulation of legislation for the disposal of the government-owned synthetic rubber plants has all but overshadowed a most important consideration, that is, the future of synthetic rubber research, particularly basic or fundamental research, in the United States.

The Shafer Bill calls for a report by the Disposal Commission to the Congress not more than 30 days after the termination of the negotiation period for sale of the plants, which will include:

"A program for the continuance, to the extent it deems necessary, during the fiscal year following the fiscal year in which the transfer period terminates, of the research program on synthetic rubber and its component materials then being carried on."

The Capehart-Bricker Bill, on which hearings in the Senate are scheduled June 24, states:

"One year after transfer period or as soon as Congress convenes thereafter, the President is to report to Congress on the nation's rubber needs and resources and need, if any, of further Government basic research on synthetic."

The Senate bill specifically mentions "basic" research, and it is in this connection that further definition of what is meant by "basic" research is needed, and the differences between basic and applied should be carefully enumerated. The reason for this point is that private industry sometimes does not understand too well the difference between fundamental or basic research and applied research and thinks mostly in terms of the dollars spent for all research.

In the course of the hearings on the Shafer Bill before the House Armed Services subcommittee on rubber in early June, John L. Collyer, president of B. F. Goodrich, came out against "government-financed research and testing in rubber after government-owned production facilities are disposed of." In the questioning that followed his prepared statement, however, he said that he would not want his testimony to be understood as ruling out research, presumably fundamental research, by or for the government, done under contract in universities or private research institutions.

Thomas Robins, Jr., president, Hewitt-Robins, Inc., in his testimony before the same committee, asked for continued operation of the Akron Government Laboratory for five years, but for a very special reason. He said:

"A second point on which considerable discussion has taken place relates to the Akron pilot plant and research facilities. We note that section 11 of the bill provides that this facility should not be sold, and section 9 calls for its continued operation for one year after plant disposal. We would like to see a provision made for continued operation and government ownership of this facility for a period of five years, the government to provide the funds necessary only for maintenance of the facility and a nucleus of a research staff, with the understanding that by grant or lease and the payment of proper allowable costs the facilities and nucleus personnel could be availed of by non-participants in the plant purchase arrangements or, for that matter, by participants also.

"We specify a term of five years because we have a feeling that such a period, and not much less time, might see the formation of a privately sponsored rubber research institute or something along those lines which will fill the gap, for the smaller user, of the research program carried on these past few years with government money, but for the most part staffed by a relatively small group of privately employed research and development men."

Much has been written in a general way about basic *versus* applied research. Some very pertinent observations were made a couple of years ago by H. G. Houghton, of the Massachusetts Institute of Technology, on the occasion of the Sixtieth Anniversary Convocation of Drexel Institute of Technology in Philadelphia, Pa., in November, 1951. His comments follow:

"Basic research, which we talk about so glibly, is not well understood by the community as a whole. Industrialists have been educated to understand the need for applied research and have seen it pay off in dollars and cents. In general, basic research was started long before applied research, and we had a great storehouse of basic research results to meet the needs of applied research. However, the growth of applied research has been so great in the past decade that our store of basic knowledge is being rapidly depleted in many areas. This has led to a demand for more basic research with an urgency that often defeats its purpose. . . .

"We need more adequate financial support of basic research together with a real understanding of the nature and importance of basic research. . . . My conclusion is that unless we really understand and properly stimulate basic research, our future progress in applied research, and hence in our industrial economy, will be severely limited."

India RUBBER WORLD suggests that government and industry give serious consideration during the next year to the continuation of an integrated program of research on synthetic rubber, sponsored jointly or independently, but directed by the National Science Foundation or some other similar non-commercial organization.

R. G. Seaman

DEPARTMENT OF
PLASTICS TECHNOLOGY

Vacuum Metallizing of Plastics

J. Gordon Seiter[1]

IT HAS long been known that under vacuum conditions different chemical elements or compounds will evaporate, depending on temperature, and travel in molecular form in straight lines to deposit on the surfaces of objects in their paths. Only since the development of high-speed vacuum pumps and efficient airtight vacuum systems, however, has vacuum metallizing been found to be a practical and profitable industrial process. Metal coatings can now be deposited under high vacuum on all phenolics, ureas, melamines, methacrylates, styrenes, glass, paper, textiles, and other surfaces.

The essential principles of vacuum metallizing are quite simple. Objects to be metallized are arranged on racks (see Figure 1) and sealed in a vacuum chamber.

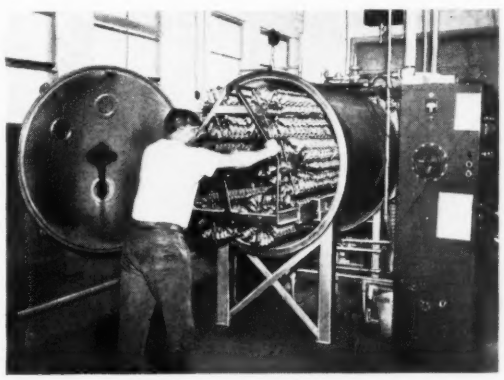


Fig. 1. Revolving Racks, Loaded with Plastic Loving Cups, Being Placed in Stokes Model 426 Vacuum Metallizer. Rotating Racks Permit All-Over Metallizing of Cups

A high vacuum is drawn, and a high temperature applied to exceed the melting point of the metal being deposited. The metal vaporizes, and its molecules travel in straight lines to deposit themselves on the first facing surface, the object being metallized, in the form of an extremely thin film of glistening metal.

The metallized objects are then removed from the chamber, lacquered for protection of the thin metal film, and, if necessary, dyed to any desired color. Objects can be coated on one side only, coated all over by the use of rotating racks (see Figure 2), or coated continuously on rolls. The rotating shaft is actuated from outside the vacuum chamber by appropriate linkages operating through a vacuum-tight rotary seal. This procedure, of course, is vacuum metallizing in its simplest terms.

[1] Manager of vacuum metallizing department, F. J. Stokes Machine Co., Tabor Rd., Philadelphia 20, Pa.

Numerous applications pose special problems and, in some cases, require the use of extra steps before or after metallizing. With some materials, absorbed or contained gases must be exhausted before metallizing, and out-gassing in a separate chamber is recommended in these cases. Many highly absorbent materials not only require out-gassing, but also must be flooded with bone-dry air or inert gas to protect the surface during the brief period of transfer from the out-gassing to the metallizing chamber. Wood, rubber, and cork have been found to be unsuitable for efficient vacuum metallizing because of excessive out-gassing. Most materials, however, can be metallized satisfactorily by the simple expedient of applying a coat of lacquer to seal in the gases. At the same time this lacquer coat provides a smooth, glossy surface for the metallized film.

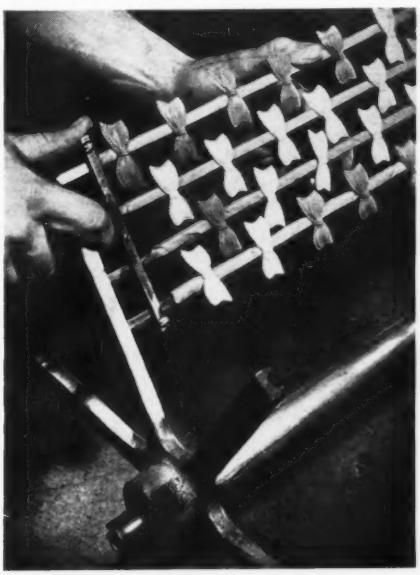


Fig. 2. Close-up of Rotating Rack Shows Loaded Frame Being Installed on Spider

Vacuum metallizing should not be confused with vacuum sputtering or with vacuum spraying under mechanical or thermal impulse. It is true vaporization of metals or salts in an extremely high vacuum. Under these conditions the metals or salts are reduced to molecular particles which are free to move in the absence of a restraining air pressure.

Comparison with Other Processes

Vacuum metallizing is one of the four chief methods of depositing metallic coatings; the others are electroplating, chemical reduction of silver nitrate, and electrostatic spraying. Each method has its particular advantages and disadvantages.

Electroplating will produce a metallic coating of any desired thickness; while vacuum metallizing will produce only a thin coating on the order of 0.000005-inch or less. Electroplating, however, requires an object having electrical polarity; while vacuum metallizing does not. Compared with electroplating, the cost of vacuum metallizing, including amortization of equipment, is less than one-quarter on the same items. An important safety factor in favor of vacuum metallizing is that it completely eliminates the hazards of handling corrosive and noxious chemicals.

Chemical reduction of silver nitrate is an excellent method for coating interiors, as of vacuum bottles, but is relatively expensive. Electrostatic spraying is a good process for reaching exterior surfaces, but, like electroplating, requires electrical polarity in the object being coated.

Vacuum metallizing finds wide usage in the application of metallic coatings, either functional or decorative, to materials which are non-conductors of electricity. In the decorative field the high metallic luster produced by vacuum metallizing has increased the attractiveness of many products. These metallized coatings are usually covered with transparent lacquers which can be dyed to give decorative effects in a full range of metallic colors. As for functional uses, vacuum metallized coatings can be made to reflect, partially reflect, or partially transmit light and heat waves; conduct current; or act as a barrier to the transmission of water vapor or other gases.

Properties of Metallized Coatings

Vacuum metallized coatings are extremely thin, usually 0.000001-0.000005-inch thick. They are proof against tarnishing, but will not tolerate abrasion. They are highly reflective when deposited to opacity on smooth, glossy surface finishes. Thickness and reproducibility of the metal coating or film can be controlled to 0.000001-inch. These films can be deposited so as to be invisible, semi-transparent, completely opaque, or any intermediate gradation. An aluminum film opaque to sunlight is about 0.000005-inch thick. Such a film will completely cover the color of the object on which it is deposited and permits the use of scrap plastic materials which would otherwise be rejected because of color.

Any metal film more than 0.000010-inch thick is probably too costly to make by vacuum metallizing in the present stage of development of the process. A rule-of-thumb figure for the process of 1¢ per square inch, including all operations, labor, overhead, and amortization of equipment, at once limits the usefulness of the process for some products. Continuous roll metallizing of acetate sheet, however, shows costs as low as 1¢ per square foot. As compared with electroplating and the silver reduction process, vacuum metallizing often shows large savings. Relative finishing costs per 1,000 pieces by the different processes for a typical part are as follows:

By electroplating	$14.00
Silver reduction	7.00
Vacuum metallizing	3.00

Practically any metal and many salts can be deposited by the vacuum metallizing process. Aluminum, because of its low cost, ease of vaporization, and high reflectivity (89%), is most commonly used. It has the same color, when deposited by vacuum metallizing, as polished platinum, rhodium, or chromium. Even when unlacquered, the coating does not tarnish; when covered with a topcoat of lacquer, it can be protected permanently against abrasion and permanently dyed to simulate any metallic color.

Gold and silver are used in vacuum metallizing if the application is such that the pure metals are required rather than the simulated colors. Nickel and chromium are sometimes used despite the high vaporization temperatures required. Platinum, tungsten, tantalum, and molybdenum can be used, but are quite difficult to evaporate. Many metal salts are used as coating materials in the production of low reflectance surfaces on lenses and similar parts.

Control of coating thickness to almost infinitesimal dimensions by vacuum metallizing makes it possible to create surfaces on glass, for example, which are non-reflective, partly reflective, or opaque and fully reflective to visible light and infrared radiation.

The adhesion of vacuum metallized coatings is excellent. The coating is fully flexible on cloth, paper, acetate sheets, and other materials subject to frequent flexing. Since the coatings are heat reflective, they can be used on cloth for arctic wear to reduce loss of body heat without adding to the bulk or weight of the garment and still permit the cloth to "breathe."

Vacuum metallizing of paper or plastic films reduces moisture vapor transmission, often to as little as 0.5-milligram per square inch in 24 hours, so that they are suitable for moisture-proof packaging.

Vacuum Metallizing Equipment

The equipment for vacuum metallizing consists of (1) the vacuum chamber, (2) the pumping system, (3) evaporation sources, and (4) jigs and fixtures. The chamber is an airtight container capable of being evacuated to a pressure of 0.5-micron or below (one micron equals 0.00002-inch of mercury; while atmospheric pressure is 29.92 inches of mercury). Since the system must be vacuum-tight before evaporation takes place, all air (up to 99.9999%) in the chamber must be eliminated to guarantee that the evaporated metal will be deposited on the object to be coated without being deflected by air molecules remaining in the chamber.

Although the size and the shape of chambers vary, two types are in general use today: the cylindrical chamber with dished ends, one of which opens (see Figure 3); and the hemispherical or bell-jar type. In some cases the object to be metallized can serve as the vacuum chamber itself when all or a portion of its inside surface is to be coated. Examples of such parts are sealed beam headlights and television tubes.

An important part of the installation is the pumping system which usually consists of a roughing or fore pump, and a diffusion pump. The fore pump is required because the diffusion pump, although suitable for removing vestiges of air, cannot exhaust against atmospheric pressure. The larger the capacities of the roughing and diffusion pumps, the faster the pump-down time and the more cycles per day of metallized parts.

Evaporation sources for metallizing aluminum usually consist of one or more tungsten wires twisted together and fastened to insulated electrodes inside the chamber. Small pieces of aluminum wire are hung on this filament through which a low-voltage, high-amperage current is passed when the chamber has been evacuated properly. The aluminum first melts and "wets" the tungsten; then, as the temperature is raised, the aluminum evaporates and deposits by condensation on the surfaces being coated. In a large chamber a number of filaments must be used; these can be fired either simultaneously or in sequence.

The function of the jigs and fixtures is to hold the

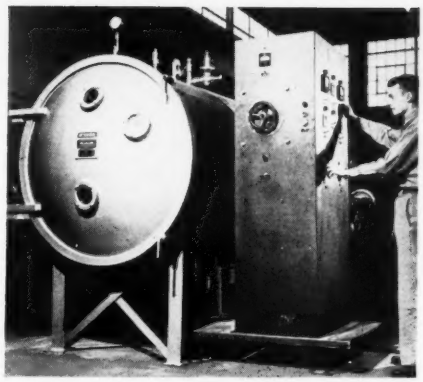


Fig. 3. Stokes Model 426 Vacuum Metallizing Unit Showing Cylindrical Chamber with End-Opening Door, and Control Panel

objects so that the surfaces to be coated will intercept the vaporized metal particles traveling in straight lines from the source. If only one side of an object is to be coated, the objects are placed on stationary jigs arranged around the walls of the chamber so that the side to be coated is facing the source. When the objects are to be coated on all sides, they are placed on rotating racks which expose all the surfaces to the flow of metal molecules.

Both the science of vacuum metallizing and the demand for specialized metallizing equipment are developing so rapidly that equipment specifications are constantly changing. The following specifications, however, cover typical current production model vacuum metallizing units made by F. J. Stokes:

	Model 425 Laboratory or Small Production Unit	Model 426 Production Unit	Model 427 Production Unit
Chamber dimensions, in.			
Inside length	30	60	60
Diameter	24	48	72
Number of racks (for one-side coating)	6	7	11
Suggested rack size, in.	10 x 30	15 x 60	15 x 60
Number of rotating spiders	1	6	10
Filament power supply, kva.	2	15	15
Diffusion pumps: number	2	2	2
Size, in.	6	14	14
Booster pump	None	Stokes 6-In. Microjet 147-D	Stokes 6-In. Microjet 147-D
Roughing pump: type	Stokes Microvac 149-F	Stokes Microvac 412-F	Stokes Microvac 812-F
Capacity, cu. ft./min.	60	325	500
Holding pump: number	1	2	2
Type	Welch 1403	Welch 1403	Welch 1403
Manifold diameter, in.	8	16 (two)	16 (two)
Vacuum valves: number	1	2	2
Size, in.	8	16	16

One of the big problems in handling plastic objects is to seal off the surfaces so that any latent solvent or plasticizer, or gases in the material will not come out under high vacuum. If these objects do gas, the metal molecules will be deflected, and a satisfactory finish will not be obtained. It is essential to cover these plastic parts with a suitable lacquer, depending on the type of material. This lacquer will also give a glossy finish to the metallized part. Ordinarily the vacuum coating is so thin that it closely reproduces each detail of the plastic surface. It is imperative, therefore, to coat the surface for perfect smoothness as well as seal it off against residual gas.

Lacquering is performed with either spray booth equipment or a dip-tank arrangement. Spraying must be done in a dustfree area so that the lacquer does not pick up any dust particles which ultimately would detract from the appearance of the finished metallic film. Many types of lacquers are available for use as undercoatings preceding metallizing, and as topcoatings after deposition of the metallic film. In "second-surface" coating where the dyed color is viewed through the clear plastic or glass piece, as in automobile escutcheons, the protective lacquer is usually an opaque film unseen from the front of the finished part.

Vacuum Metallizing Process

Steps in the vacuum metallizing process are as follows: (1) lacquering; (2) drying; (3) loading; (4) flashing; (5) lacquering; and (6) drying. The plastic objects are first given a lacquer undercoating by means of dipping or spraying, depending on practical considerations, and the lacquer coating is dried or baked. As previously mentioned, roll materials, such as acetate or cellophane sheet, are out-gassed in a separate chamber and are not lacquered.

Glass products, such as front-surface mirrors and lenses, are usually metallized without prior undercoating, but the surfaces must be chemically clean. Radiant heat is usually applied to the glass within the vacuum chamber in order to remove adsorbed gases and moisture from the surface. As a final preparatory step, the glass is subjected to a high-voltage "glow discharge" within the chamber to remove the last traces of impurities. A high-voltage transformer and an extra electrode ionize the gas within the chamber and bombard the glass surface with electrons to effect this final cleaning.

For many products the drawing of a vacuum alone is sufficient to take care of out-gassing and moisture. This operation can be helped by heating the parts inside the chamber by means of a steam jacket around the chamber. When out-gassing is completed, as indicated by the vacuum gage reading, cold water is circulated through the jacket to cool the chamber and reduce to a minimum any residual molecular surface activity. While heating and cooling is not absolutely necessary, it speeds up the production pumping cycle. When steam is not available, radiant heat may be used. Objects are ready for the metallizing operation when pressure inside the chamber has been reduced to 0.5-micron or below.

Using aluminum as a typical example of the metal to be deposited, the usual procedure is to hang small aluminum staples from the tungsten wire filaments. The number of filaments will depend on the amount of metal to be deposited, and the filaments are mounted coaxially parallel to the axis of the chamber.

With the objects to be metallized in place on the

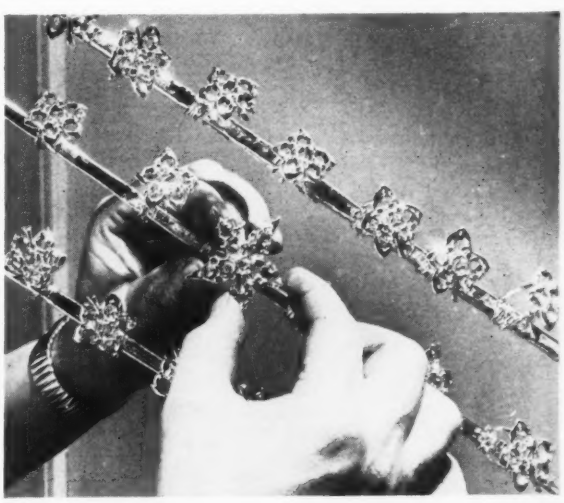


Fig. 4. Costume Jewelry after Metallizing Shows Brilliant Metallic Finish

racks, the filaments are heated to incandescence at 1,200° F. so that the aluminum melts and "wets" the tungsten. The aluminum is now in the form of thin webs which evaporate in molecular flight as the temperature is raised rapidly to 1,800° F. Up to this point the operation is clearly visible through the sight glasses in the chamber door. Evaporation or "flashing" of the filaments takes 5-10 seconds, and during this period the sight glasses and interior surfaces of the chamber are metallized as well as the objects put in for that purpose.

Salts cannot be attached to the tungsten filaments and are evaporated from "boats" made by forming tungsten or molybdenum sheets into V-shaped troughs and crimping the ends to form containers. Each end of the boat is fastened to the electric line, and, as current is applied, the boat becomes incandescent, melting and evaporating the salt. This method provides a large surface of evaporating metal and is best suited for applications requiring relatively large amounts of metal, as in the continuous metallizing of sheet stock on rolls.

Applications

Christmas tree ornaments, fancy wrapping papers and films, costume jewelry (see Figure 4), sequins, and emblems are obviously metallized for decorative purposes, and the color range obtained through lacquering and dyeing covers the entire visible spectrum.

Flashlight reflectors, costume jewelry, and cabinet hardware are also often vacuum metallized for economy, since the plastic is less costly than formed metal and does not require the relatively costly process of electroplating and buffing. Costume jewelry can be made of cheap metal or plastics and metallized at substantial savings over older processes.

Toys and other products can be made of plastics, lighter and cheaper than metal, and metallized to simulate the original subject. Automobile horn buttons, medallions, and decorative emblems are familiar metallized items of the "second-surface" coating type and have the three-dimensional effect of true metallic inserts in glass or plastic.

Functional uses of vacuum metallizing are widely varied. Many non-conductors which cannot be electroplated are easily metallized. Some non-conductors which require the heavy plating of the electroplating process are first metallized to give them a conductive surface which will accept plating. For example, record masters are metallized to form a base for heavy electroplating to make the dies from which the records are molded. Here, owing to the infinitesimal thickness of the metallized coating, fidelity to the original is precise.

Flashlights, spotlights, and infrared bulbs of high reflectivity are less costly to manufacture when coated inside by metallizing. Condensers and capacitors are now made from thin paper metallized with zinc or aluminum. These are smaller and lighter than similar parts made of aluminum foil and are self-healing in case of dielectric rupture.

Lenses for cameras and many scientific instruments are now required to be non-reflective. This condition can be effected by vacuum metallizing the glass to deposit a film of magnesium fluoride about 0.000003-inch thick. Some optical instruments require films which will divide the incident light, reflecting a part and transmitting the rest. Aluminum films accomplish this result and can be protected from handling and abrasion by a second vacuum metallized coating of silicon monoxide which, upon exposure to air, becomes a thin, hard, transparent quartz (silicon dioxide) film.

Gold stamping leaf is made by combining a thin, thermoplastic adhesive sheet with a layer of wax to an acetate sheet that is vacuum metallized with the device to be transferred. The adhesive layer is placed against the object to be marked. A hot die in contact with the acetate sheet melts the wax and releases the gold pattern which, after the acetate sheet is removed, is left as a perfect impression. The cost is low because one cubic inch of gold will cover more than 330,000 square inches of surface.

Quartz crystals used as frequency controls in electric oscillators are vacuum metallized to improve conductivity; yet the metallized film is so thin that it does not affect the vibration characteristics for which the crystals are precisely ground.

Meetings and Reports

Cathode Rays Cure Plastics

CATHODE rays, which are high-speed streams of electrons, have been found by scientists of General Electric Co., Schenectady, N. Y., to toughen flexible plastic containers so that they withstand steam, prevent certain plastic dishes from wilting in the hottest automatic dishwashers, and change sawdust into digestible cellulose. Speaking at the opening of G-E's new cathode ray laboratory in Milwaukee, Wis., on May 21, R. F. Holste, manager of industrial products for the company, said that a 15-second exposure to cathode rays is all that is necessary to cure a plastic. This cure raises the softening point of the plastic and increases its resistance to the action of many solvents.

The company's chemical division and general research laboratory are working cooperatively on the commercial development of the process. It has been found possible to control the pattern of the electron beam so that only essential portions of the plastic are treated and modified. This procedure suggests new methods of casting and forming plastic products, according to Guy Suits, G-E vice president and director of research.

Plastics in Automobiles

AT A meeting of the West Coast sections of the Society of Plastic Industry, Society of Plastic Engineers, and Society of Automotive Engineers in the Claremont Hotel, Berkeley, Calif., on June 4, M. B. Crawford, Jr., Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., told the audience that although reinforced plastics are in the automotive industry to stay, improved production techniques are needed. Adaptations of the plastics to the mass-production methods are necessary since methods currently in use are satisfactory only for production of up to 15,000 units of a single body design. Up to that point, costs compare favorably with those of producing a similar number of units in metal; beyond that figure, however, metal construction costs decline, while plastic production costs remain at about the same level.

Adhesive in Squeeze Bottle

THE marketing of a new adhesive, called Sobo, in squeeze bottles made of polyethylene has been announced by Slomons Laboratories, Inc., Long Island City, N. Y. The adhesive is also packaged in collapsible tubes, pints, quarts, and gallon containers.

Sobo is described by the company as a non-inflammable, non-toxic, quick drying, and flexible material. It drys neutral and reportedly produces a strong bond while affording greater square-foot coverage than is obtained with any other type of adhesive.

Bleed Test for PVC

DEECY PRODUCTS CO., Cambridge, Mass., has issued a comprehensive description of the Deecy U. V. bleed test for determining the compatibility of materials in a polyvinyl chloride compound. This test has been used by the company for seven years and reportedly gives a good indication of results to be expected in actual use of the vinyls.

The test consists of exposing samples, in the form of two-inch diameter disks, to a narrow band of ultra-violet light at a temperature of about 100° F. The exposure unit is designed with a water trough and aluminum foil to dissipate the heat evolved as rapidly as possible since maintenance of this low temperature in the sample is considered a critical requirement. The sample is placed on the aluminum-foil base with one end under the lip of the water trough and the other end under a heavy metal bar. The purpose of the water is to keep the air in the chamber near saturation. The sample is then exposed to 72 hours of light from a germicidal lamp placed two inches above the water trough. The amount of bleeding after this period is determined by use of an arbitrary scale which consists of seven stages of exudation, from no tackiness to droplet formation.

Data from this test should not be interpreted as indicative of the effect of aging on color or physical properties of the sample. If the effect of aging on compatibility is to be determined, samples should be aged prior to testing.

SPE Sections Meet

Retailer's View of Plastics

THE New York Section, Society of Plastics Engineers, concluded the season with a regular dinner-meeting on June 17 at the Gotham Hotel, New York, N. Y., with some 80 members and guests attending. Guest speakers were Frank Gottheimer, technical writer, who gave a "Report of the British Plastic Productivity Team," and Ephraim Freedman, director of Macy's Bureau of Standards, who discussed "Plastics from the Retailer's Point of View."

Mr. Gottheimer summarized the report by the British team which visited and surveyed the American plastics industry in 1952 and compared this industry with that in Britain. The team reported that the American thermoplastics molders use more preplasticizing and preheating than do British molders, and the former also tend to modify their machines to use larger and fewer heating bands. American thermoplastics molds are stronger and better designed than their English counterparts. Although American thermosetting molding machines are generally older than those used in Britain, they are more productive because of faster cycles resulting from improved materials and more widespread use of pelleting and preheating. In general, the old machines used in America for thermosetting molding are being modernized by modifications rather than being replaced by new machines. Molded items in Britain show a much greater emphasis on fine finishing, apparently because of a more critical attitude on the part of consumers.

Mr. Freedman reported on a recent survey of Macy's buyers to determine their attitude toward plastics. Some of the points brought out in this survey were as follows: opaque styrene buttons and ornaments for dress are not satisfactory because they are not readily identified by cleaners; plastics bristles in toothbrushes are often held in place inadequately; plastic-encased wire clothesline cord is proving very acceptable; polyethylene garment bags and storage containers are quite satisfactory while vinyl bags, although popular, are often softened by moth preventatives; vinyl yard goods are often inferior products and show a great need of informative labels; properly made four-mil thick vinyl raincoats are acceptable for utility use, but thinner or sewn-seam coats are not satisfactory; unsupported vinyls are not acceptable for use in luggage because of appearance and excessive flexibility; acetate bottoms for golf club bags have been cracking in service; in toys other than dolls, there is a definite trend away from styrene and some other rigid plastics because of cracking; plastic wading pools have been acceptable in service; glass fiber laminate bulk toys are satisfactory if made to be sufficiently impact resistant; vinyl inflatables have demonstrated the value of informative labeling; there is a trend from styrene to polyethylene refrigerator containers; melamine tableware is popular, but needs some improvement in brilliance of finish; urea dishes are acceptable for picnicware; and styrene wall tile has good acceptance, but is somewhat expensive.

The conclusions brought out by Mr. Freedman and the discussion which followed his talk were: (1) certain plastic products are misapplications because of insufficient durability; (2) more attention is needed toward finishing of some products, as well as toward design, color, and finish; (3) there is a definite need of informative labels on plastic items; (4) more education of consumers and retailers regarding plastics is needed; and (5) further development and use of quality standards are necessary.

Section President Saul Blitz, Tico Plastics, presided over the meeting, and Program Chairman Irvin I. Rubin, Robinson Plastics Corp., introduced the speakers. Guests of honor at the meeting were the SPE national officers and national directors. Table favors were distributed through the courtesy of Empire Brushes, Inc., Naugatuck Chemical Division of United States Rubber Co., and Robinson Plastics, and the meeting closed with a drawing for six door prizes contributed by Jamison Plastic Corp.

CALENDAR

July	24.	Chicago Rubber Group, Summer Outing, St. Andrews Golf & Country Club, West Chicago, Ill.
Aug.	4.	New York Rubber Group, Golf Tournament, Baltusrol Golf Club, Springfield, N. J.
Aug.	21.	Philadelphia Rubber Group, Annual Outing, Cedarbrook Country Club, Philadelphia, Pa.
Sept.	9.-11.	Division of Rubber Chemistry, A. C. S. Sherman Hotel, Chicago, Ill.
Sept.	12.	Connecticut Rubber Group, Annual Outing, Paterson Club, Fairfield, Conn.
Sept.	17.	Southern Ohio Rubber Group, Engineers' Club, Dayton, O.
Sept.	19.	Northern California Rubber Group, Summer Picnic, Adobe Creek Lodge, Los Altos, Calif.
Oct.	6.	Buffalo Rubber Group, Hotel Westbrook, Buffalo, N. Y. The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.
Oct.	8.	Northern California Rubber Group.
Oct.	14.	Newark Section, SPE, Military Park Hotel, Newark, N. J.
Oct.	16.	New York Rubber Group, Henry Hudson Hotel, New York, N. Y. Boston Rubber Group, Boston, Mass.
Oct.	21.	Washington Rubber Group, Washington, D. C. New York Section, SPE, Hotel Gotham, New York, N. Y.
Oct.	27.	Association of Consulting Chemists & Chemical Engineers, Inc. Twenty-Fifth Anniversary and Annual Meeting, Hotel Belmont Plaza, New York, N. Y.
Nov.	13.	Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Pa.
Nov.	18.	Washington Rubber Group, Washington, D. C. New York Section, SPE, Hotel Gotham, New York, N. Y.
Nov.	19.	Rhode Island Rubber Club, Metacomet Golf Club, East Providence, R. I.
Dec.	11.	New York Rubber Group, Christmas Party, Henry Hudson Hotel, New York, N. Y. Boston Rubber Group, Christmas Party.

Color Discussed at Ontario

A talk on "Our World of Color," by H. C. Doner, Plaskon Division, Libbey-Owens-Ford Glass Co., was the highlight of the June 16 dinner-meeting of the Ontario Section, SPE, held at the St. Regis Hotel, Toronto, Ont., Canada. After discussing the role played by color in all aspects of human life, the speaker displayed six-inch disks of Plaskon urea-formaldehyde plastic made to match the 29 popular *House and Garden* colors. The company has developed more than 11,000 colors in the past 20 years to satisfy demand, but these new colors harmonize with current merchandise made by 269 leading manufacturers of paints, furniture, radios, television sets, appliances, textiles, and floor coverings.

Viscosity Standard Adopted

THE National Bureau of Standards, Washington 25, D. C., has announced the adoption of the value of 0.01002-poise for the absolute viscosity of water at 20° C. as the primary standard for the calibration of standard viscosity samples and viscometers. In the past the value of 0.01005-poise had been the standard.

The use of the new value will result in a reduction of 0.3% in the measured values of viscosity and will make viscosities reported in absolute units correspondingly more accurate. Previously published data may be adjusted to the new standard by reducing it by 0.3%.

In addition to NBS, the American Society for Testing Materials, the National Physical Laboratory in England, and the Physikalisch-Technischen Bundesanstalt in Germany indicated they would also adopt the new value on July 1, 1953.

Scientific and Technical Activities

Near Record Attendance Features Fine Meeting of Rubber Division at Boston

THE efforts of the local committee on arrangements for the sixty-third meeting of the Division of Rubber Chemistry, American Chemical Society, at the Statler Hotel, Boston, Mass., May 27 through 29, were rewarded by a near record attendance of 1,010, with 921 members and guests present at the banquet on Thursday evening. The chairman of the Division, Seward G. Byam, E. I. du Pont de Nemours & Co., Inc., paid tribute on several occasions to the chairman, Harry W. Sutton, Boston Woven Hose & Rubber Co., and his local committee, for their excellent work in arranging for such a successful meeting.

Some of the special features of this meeting were the 25-Year Club luncheon on Wednesday noon, May 27, the several plant trips on the afternoon of May 28, the special banquet program of the same evening, which included celebration of the twenty-fifth anniversary of *Rubber Chemistry and Technology*, and an excellent program for the ladies attending the meeting.

Abstracts of the papers presented at the technical sessions appeared in our May issue;[1] so only brief mention of some of the highlights of this part of the program will be included in this report. An innovation by Chairman Byam in having other prominent Division officers and members preside at some of the technical sessions deserves mention. Mr. Byam, of course, presided at the opening session on the afternoon of May 27, but the second session on the morning of May 28 had as its presiding officer Joseph L. Haas, Hodgman Rubber Co., and the third session, on the morning of May 29, had Alan W. Bryant, Binney & Smith Co., presiding.

25-Year Club Luncheon

W. E. Kavenagh, Goodyear Tire & Rubber Co., was chairman of the 25-Year Club luncheon and in his opening remarks also paid tribute to Mr. Sutton and to Harry Atwater, Hood Rubber Co., for their work in arranging the details of this affair. A very fine attendance of 196 members of the 25-Year Club marked this luncheon.

As in the past, the first order of business was a moment of silence in respect to members of the Club who had passed on since the last meeting. These members were: Jack Johnson, Hodgman; C. C. Cashion, Xylos Rubber Co.; R. H. Crawford, B. F. Goodrich Co.; E. C. Croakman, Binney & Smith Co. of Canada; George Griffin, Harwick Standard Chemical Co.; D. A. Shirk, Rare Metal Products Co.; and T. J. Starkie, Witco Chemical Co.

A special feature of this luncheon was the presentation to all members present of a very fine lapel insignia, which had been prepared through the courtesy of Owen D. Brown, Jr., Godfrey L. Cabot, Inc., for each member of the club. Evidence of the appreciation of the members for this gesture was apparent.

Mr. Kavenagh then asked E. B. Curtis, R. T. Vanderbilt Co., to conduct the roll call of members according to their years of service in the rubber industry, starting, of course, with the new "freshmen" who had just completed 25 years of service and were becoming members of the Club at this meeting. At the point of 49 years of service, only two men remained standing: Harold Fuller, retired, and Charles Haynes, Binney & Smith Co., and secretary of the Division. Both of these men were therefore presented with a suitable memento of the occasion in the form of a properly inscribed silver dollar dated 1878. The presentation was made by Harold Glidden, retired. Mr. Kavenagh, with more than 50 years' service, and other veterans had been previously honored.

It was announced that the chairman for the next meeting of the 25-Year Club to be held in connection with the Division meeting in Chicago in September would be H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp.

Technical Sessions and Business Meetings

The papers presented at the first session on the afternoon of May 27 were mostly concerned with oil-extended synthetic rubbers and recent developments in synthetic rubber polymerization. In addition, the final paper at this session discussed the properties of the new super abrasion furnace blacks. J. F. Svetlik, Phillips Petroleum Co., who presented this paper, stated that SAF black, which imparts very high strength, greater toughness, greatly superior resistance to abrasion, and, incidentally, increased electrical conductivity to rubber, is a material of very fine particle size produced in a continuous furnace process. In passenger tires it has been demonstrated that SAF black imparts 35 to 43% greater tread life than the types of carbon black in common usage, Mr. Svetlik added. H. E. Railsback and C. C. Biard, also of Phillips, were co-authors of this paper.

The second technical session on the morning of May 28 included papers on aging, the structure and compounding of neoprene, and finally a paper on the new Chemigum SL, Goodyear's polyester rubber. A very considerable amount of discussion from the floor followed the presentation of some of these papers, particularly the one on Chemigum SL.

The final session on the morning of May 29 had a series of papers on both natural and neoprene latices. Of special interest were the papers on particle size distribution in GR-S latices, by authors from Naugatuck Chemical Division, United States Rubber Co.; a special method for measuring wet gel strength of coagulant dipped films, by workers at Boston University; and on the stability and compounding of neoprene latex, by workers from du Pont.

The business meeting of the Division was held at about 11:00 a.m. on the morning of May 28 during the second technical session. Chairman Byam first asked for a moment of silence and prayer for the members who had died since the last meeting: C. C. Cashion; E. C. Croakman; D. A. Shirk; C. L. Hammond; H. M. Smallwood, U. S. Rubber; and E. C. Dill, Dayton Rubber Co.

The chairman then reported on the last meeting of the Division held in Los Angeles in mid-March, at which an attendance of between 200 and 300 was recorded. Of this total it was stated that about 75 were from the East. It was further mentioned that this Division banquet had been honored by the presence of President Farrington Daniels and President-Elect Harry L. Fisher, of the A. C. S.

Mr. Byam next reported on some of the matters which had been discussed at the meeting of the executive committee of the Division on May 27-28.

He stated that the library service of the Division was assured of continuation through the Spring of 1954 by virtue of funds obtained by members Waldo Semon, of Goodrich, and Jack Moore, of Harwick Standard. The chairman urged Division members to make as much use as possible of the Division library in order that the executive committee could determine the desirability of continuing this service. In addition he said B. S. Garvey, Jr., Sharples Chemicals, Inc., chairman of the library committee, had reported that interest in terms of use was increasing.

It was next reported that publication of the Division monograph on synthetic rubber was now scheduled for the Spring of 1954.

In the discussion of future meetings mention was made of the meeting to be held in Chicago, Ill., September 9-11, this year, and members were reminded that the deadline for abstracts of papers to be presented at this meeting was, of necessity, June 26. H. Boxser, Acadia Synthetic Products Co., is chairman of the local committee on arrangements, and the Division headquarters will be the Hotel Sherman. It was announced that the spring meeting in 1954 will be held in Louisville, Ky., April 14-16, and that F. Waggoner, of du Pont, will be the chairman in charge of local arrangements for this affair. The 1954 fall meeting will be held in New York, N. Y., September 11 through 13, with headquarters at the Hotel Commodore.

Byam announced that a new committee headed by A. E. Laurence, Phillips Chemical Co., had been appointed to work on the scheduling of meetings two or three years in advance. In this connection it was stated that the meetings to be held in 1955 have been tentatively scheduled for Detroit, Mich., in the spring, and Philadelphia, Pa., in the fall. Both of these 1955 meetings will be held separate from meetings of the parent society.

J. Hoesley, Goodyear, chairman of the membership committee, then reported that membership of the Division in the Spring of 1952 had been 2,900. In the Fall of 1952 at the time of the meeting in Buffalo, N. Y., Division membership totaled 3,174, and the latest figure for membership at this time was 3,276. The chairman of the Division congratulated Mr. Hoesley on his report.

The report of the nominating committee headed by F. W. Stavely, Firestone Tire & Rubber Co., was presented by R. G. Seaman, India RUBBER WORLD, in the absence of Dr. Stavely. The nominees for officers and directors from the areas of the sponsored local rubber group were as follows: vice chairman, J. M. Ball, Midwest Rubber Reclaiming Co., and G. R. Cuthbertson, U. S. Rubber; secretary, F. H. Amon, Godfrey L. Cabot, Inc., and A. M. Neal, du Pont. Directors for the areas of the local rubber groups with elections due this year were nominated as follows: *Connecticut*, G. R. Sprague, Sponge Rubber Products Co., and C. A. Larson, Whitney Blake Co.; *Detroit*, H. W. Heorauf, U. S. Rubber, and W. J. Simpson, Chrysler

[1] P. 214.

Corp.; *Northern California*, J. Oser and R. D. Ford, both of Mare Island Naval Shipyard; *Philadelphia*, H. J. Reid, U. S. Rubber, and T. W. Elkin, Armstrong Cork Co.; *Rhode Island*, F. W. Burger, Kleistone Rubber Co., and Charles Berlow, Berlow & Schlosser Co.; *Southern Ohio*, S. J. Miller, DuBois Co., and J. R. Wall, Inland Mfg. Division, General Motors Corp.; *Washington, D. C.*, G. E. Meyer, Latex & Rubber, Inc., and R. E. Harmon, consultant. The retirement of C. R. Haynes, Division secretary for the last eight years, made necessary the additional nominations for secretary.

Finally Mr. Byam called on Waldo L. Semon, chairman of the Charles Goodyear Medal Award Committee, who announced that John T. Blake had been designated the 1953 Charles Goodyear medalist. The medal will be presented to Dr. Blake on September 10 at the meeting in Chicago. Dr. Blake, director of research of Simplex Wire & Cable Co., is a former chairman of the Division and has also been a national councilor of the Society and chairman of its Northeastern Section. He has also been chairman of the Boston Rubber Group, Boston Section of the American Institute of Chemical Engineers, the Boston Research Directors Club, and the subcommittee on wire and cable of Committee D-11 of the American Society for Testing Materials.

In addition Dr. Blake is co-editor of the A. C. S. monograph, "Chemistry and Technology of Rubber," and has published many scientific articles dealing with rubber compounding and processing. He has also been the recipient of many other honors, and his selection as 1953 Goodyear medalist will certainly be considered most appropriate by his many friends both in and out of the Rubber Division.

The Division Banquet

The Division banquet on the evening of May 28 was preceded by a reception for those seated at the head table and their ladies. Chairman Byam presided and acted as toastmaster for the banquet itself and, after again congratulating the local committee on arrangements for their excellent work in connection with the meeting, urged the members to plan now to attend the meeting in Chicago in September and reviewed the plans for future meetings in 1954 and 1955.

Those seated at the head table are shown in the accompanying photograph and included Harry L. Fisher, president-elect of the Society; H. A. Winne, vice president of General Electric Co.; and Walter J. Murphy, editor of the Society's applied journals; besides the officers and directors of the Division and members of the local committee.

One of the special surprise features of the banquet program was the Twenty-Fifth Anniversary Celebration of *Rubber Chemistry and Technology*, honoring the editor, C. C. Davis, and Mrs. Davis. This part of the program included short talks by Drs. Fisher, Blake, and Murphy, and, finally, presentation of a large inscribed Paul Revere silver bowl to Mr. Davis.

Dr. Murphy in his remarks paid tribute to C. C. Davis as "a man who had done more than any other man to contribute to the growth and success of the Society's Rubber Division." He also expressed the regrets of Alden Emery, secretary of the Society, who could not be present, but who wrote that he wished to join the Division members and officers in congratulating C. C. Davis on his 25 years of service to rubber chemists, for which he was sure they were all deeply grateful.

Dr. Fisher discussed the history of *Rub-*

Head Table, Division Banquet, (*Left to Right, Top Row*): C. S. Yoran, Brown Rubber Co., Division Director, Fort Wayne; T. M. Knowland, Boston Woven Hose, Local Committee; L. L. Longworth, Monsanto Chemical Co., Local Committee; G. N. Vacca, Bell Telephone Laboratories, Director, New York; R. S. Griffin, du Pont, Local Committee; H. Boxser, J. A. Williams, Haartz-Mason, Inc., Local Committee; A. E. Laurence, Director, Chicago; B. H. Capen, Tyer Rubber Co., Vice Chairman, Local Committee; B. S. Garvey, Jr., Director, Philadelphia; A. M. Neal, A. C. S. Councilor; W. L. Semon, Immediate Past Chairman of Division; A. W. Oakleaf, Phillips Chemical, Division Treasurer; O. J. Brown, Jr., Local Committee; J. T. Blake; H. A. Winne; H. L. Fisher, Tlargi Technical Foundation, Director, Washington;

(*Left to Right, Second Row*): Division Chairman Byam; J. C. Walton, Boston Woven Hose, Division Vice Chairman; C. C. Davis; H. W. Sutton; C. R. Haynes; R. B. Stringfield, Fullerton Mfg. Co., Division Director-at-Large; Walter J. Murphy; E. H. Krismann, du Pont, Advertising Manager, *Rubber Chemistry and Technology*; G. M. Wolf, Sharples Chemicals, Director, Detroit; W. E. Kavenagh; J. L. Haas, Director, Boston; E. D. Covell, Stedfast Rubber Co., Local Committee; C. A. Ritchie, Goodrich, Director, Akron; A. W. Bryant, Binney & Smith, Local Committee and Chairman, Boston Rubber Group; W. E. Walker, Hood, Local Committee; and H. L. Ebert, Firestone Tire & Rubber Co., Director, Rhode Island

Chairman Byam Presenting Inscribed Silver Paul Revere Bowl to C. C. Davis in Celebration of His 25 Years as Editor of *Rubber Chemistry and Technology*

ber Chemistry and Technology, since he had been the chairman of the Division in 1928 and had appointed the one and only editor this Division publication ever had. In tracing the origin and history of the journal, Dr. Fisher read some portions of correspondence dating back to 1927 and 1928, the first of which was a letter from R. P. Dinsmore, of Goodyear, to Charles Parsons, then secretary of the Society, in which the former reported that at a meeting of the executive committee of the Division, held at Richmond, Va., the committee had asked for more extensive publication and separate publication of papers given before it. In a letter to Dinsmore from Parsons the latter agreed to meet with the Rubber Division executive committee to discuss this matter, but pointed out that the expense of such publication would have to be paid by the Division. Then on October 4, 1928, Dr. Fisher asked C. C. Davis to be editor of the Division's new publication, with W. W. Evan, R. T. Vanderbilt Co., as managing editor. C. C. Davis wrote Dr. Fisher explaining that he would be honored to accept the editorship, but that he still had to give consideration to his obligations to E. J. Crane, editor of *Chemical Abstracts*. Davis wrote further that his main problem was that he would have to do the additional work involved at home.

Shortly thereafter, with $278 in the Division's treasury, Dr. Fisher felt that it was all right to go ahead with the project, which now had the enthusiastic and unanimous approval of the executive committee of the Division.

The first publication, called "reprints" in those days, resulted in a suggestion from C. C. Davis that the Division publication be developed into a general medium for rubber chemistry and technology, and that it contain both original articles as well as reprints of articles previously published. He also suggested the name, *Rubber Chemistry and Technology*, for the publication and emphasized the need of articles on technology as well as on chemistry.

At about that time the Division obtained a grant of $400 from A. L. Viles, president of The Rubber Manufacturers Association, to aid in the publication of the new magazine. It was also suggested that the publication carry some advertising to help defray the cost of publication.

Dr. Fisher concluded his remarks by saying that the appointment of C. C. Davis as editor of *Rubber Chemistry and Technology* was "one of the most pleasant duties he ever had."

Dr. Blake, who spoke on "The Editor as I Knew Him," stated that it was not the easiest thing in the world to describe one person to another, even though there is a long and intimate friendship. He said he had known C. C. Davis for nearly 30 years. Dr. Blake added that it was perhaps appropriate that C. C. Davis should be honored at this particular meeting since he is a member of that species of the human race known as Bostonians. He pointed out that after his education at Dartmouth and MIT, C. C. Davis had started work at Boston Woven Hose, where he has remained nearly 40 years. It was stated that as a result of his work in connection with the development of the oxygen bomb for the aging of rubber, the name Davis had become a household word in rubber technology.

C. C. Davis was associated also nearly 35 years ago with *Chemical Abstracts*. Thus the world's literature in the chemistry of rubber has passed through his hands and mind, during all this time. Dr. Blake thus felt it safe to say that no one is more familiar with that literature than "C. C."

Dr. Blake paid tribute to the unusual combination of personal traits of C. C. Davis that have made him such a successful editor of *RC&T*. The many, many hours of reading, correspondence, translation, proofreading, etc., necessary in connection with the publication was emphasized, and it was pointed out that all of this work was undertaken without any thought of monetary reward. As a result of his work, however, C. C. Davis now has a host of friends throughout the industry and abroad since anyone who has more than a casual contact with him considers him a real friend.

Dr. Blake concluded his remarks with a tribute to Mrs. Davis since, as he said, although her name does not appear on the masthead, she has been in effect an associate editor for 25 years. He expressed the gratitude of the Rubber Division and the thanks of the rubber world to Carol and Caroline Davis and wished them every happiness and another 25 years in their joint editorship of *Rubber Chemistry and Technology*.

At the conclusion of Dr. Blake's remarks a large bouquet of roses was presented to Mrs. Davis at her place at a table directly in front of the head table.

The actual presentation of the Paul Revere bowl was then made to C. C. Davis by Chairman Byam.

After receiving a standing ovation from the audience and those at the head table, C. C. Davis said he was not prepared to make a formal speech and that he had only learned about the program in his honor a few hours before. He said his only thought at that time was that possibly the Division had decided that it was "time for a change" in the editorship of *RC&T*, and this might be the occasion for the celebration.

Chairman Byam then turned the program over to Owen D. Brown, Jr., chairman of the banquet arrangements, who introduced Dr. Winne, who talked on "Energy from the Atom." Dr. Winne reviewed some of the developments in the field of atomic energy since 1945, with special reference to the use of atomic power for industrial use. He said that it was his opinion then and is now that the development of the use of atomic energy in industry would be slow and gradual. He said he felt safe in saying that an atomic power plant for generating electricity could be designed and built today. He emphasized, however, that we do *not* know how to build and operate such a plant today at reasonably competitive cost. He explained that in a large modern conventional electric power plant the first cost is in the neighborhood of $75 to $100 per electrical kilowatt capacity. Although comparative costs for atomic electric power plants are available to only a limited degree, it might be estimated that they would cost between $500 and $600 per kilowatt capacity.

Mrs. C. C. Davis *(Center)* Receiving Bouquet of Roses from the Division in Appreciation of Her 25 Years as Unofficial Associate Editor of *Rubber Chemistry and Technology*. On Her Left Is Mrs. Waldo Semon, and on Her Right, Mrs. S. G. Byam

Dr. Winne further declared that he felt that at least 15 years will pass before atomic-electric power plants will make any significant economically sound contribution to our power generation capacity. He said he believed that atomic-electric power plants may be operated safely in populated areas, but for psychological reasons it may not be advisable so to locate a plant for some time to come. He added that plenty of atomic fuel was available, but he did not think that for power generation atomic fuel would ever completely displace coal, oil, or gas. Of special interest, however, was his statement that the energy content of one pound of nuclear fuel is equal to that in about 3,000,000 pounds of coal.

Dr. Winne stated that he did not think we have anything to gain by attacking the atomic-electric power problem on an emergency or urgency basis. He was not advocating that we stop or impede scientific and technological development, but that we proceed on the basis of an orderly well-thought-out program.

In conclusion, Dr. Winne suggested that the Atomic Energy Commission and the Congress would soon begin to consider steps which might be taken, without in any way jeopardizing national security, to relax some of the stringent restrictions in the present Atomic Energy Act. He estimated the ultimate effect of peacetime usage of atomic power as making electric power available at lower cost in areas where transportation of combustible fuel is expensive and said it will be very valuable in certain special uses for powering submarines, other naval vessels, and ultimately commercial ocean vessels. The speaker was optimistic as to the benefits which the use of atomic energy in industry will bring to mankind in the rather long-term future, if we have the patience to avoid becoming discouraged by the many time-consuming difficulties which we are sure to encounter on the road to progress.

The final part of the program consisted of entertainment by the "Mr. Peepers" of television fame in the person of Wally Cox. "Mr. Peepers" first entertained the audience with a discourse on his research in the field of rubber, that is, his development of latex impregnated socks produced by the simple process of standing in one's stocking feet in a bucket full of liquid latex. Although the manufacturing process was stated to be somewhat messy, "Mr. Peepers" had nothing but good words for the wearing quality and comfort of his latex-impregnated socks for home use.

Two additional monologues on "Mr. Peepers" experiences as a young boy in grade school and then in the army concluded his appearance.

The Plant Tours

Some mention is necessary of the several plant tours arranged by the local committee, which were very well attended by the members. Buses left the Hotel Statler after lunch on Thursday and conveyed the members to the plants of Boston Woven Hose, Dewey & Almy Chemical Co., Hood Rubber, and Simplex Wire, where extended guided tours were conducted. Also on this program was a tour of the new research laboratories of Godfrey L. Cabot, Inc.

The Ladies Program

Many wives and friends of the members were in attendance at the meeting and were well entertained by a program arranged by the local committee. Registration for the ladies took place on Wednesday afternoon, following which there was a complimentary get-acquainted tea. On May 28 there was a complimentary Northeast Airlines flight over Boston, following which came tours of many of Boston's historic spots and a visit to the famous Isabella Gardner Museum. Many of the ladies joined the men at the "Pops" concert Wednesday and at the Division dance Thursday.

Arctic Cable Covering

THE Engineer Research & Development Laboratories, Fort Belvoir, Md., developed an all-weather, rubber-jacketed electric power cable for use in Arctic regions. The cable, which is also reported to operate successfully under tropic and temperate conditions, does not become stiff or brittle at temperatures down to —65° F. and can be uncoiled when frozen without danger of snapping back, it is said.

Extensive investigation by ERDL in conjunction with the Synthetic Rubber Division, Reconstruction Finance Corp., resulted in a synthetic rubber jacketing material which contains the properties necessary to withstand the extreme cold. Designated GR-S 1023, the compound consists of approximately 87 parts butadiene and 13 parts styrene combined at 122° F. Experimental work is still going on to improve the electrical, physical, chemical, and all-temperature properties of the synthetic rubber.

Use of Electron Microscope

THE Gates Rubber Co. Technical Club, at its recent monthly dinner-meeting in Denver, Colo., heard a talk by Ray McBrian, standards and research engineer for the Denver, Rio Grande & Western Railroad, on the use of the electron microscope. Mr. McBrian stated that through its usage it has been possible to eliminate much routine analysis and control from the fuel and lubricant testing program of the railroad. Machinery savings which have resulted have been great enough to justify the purchase of the microscope and associated equipment.

In addition, the speaker said that the new equipment has several highly interesting possibilities for application in the rubber field, such as the study of dispersion patterns involved in the use of various fillers and other ingredients, particle size correlations, and reinforcements.

Rubber Division, C.I.C., Windsor Meeting

THE Division of Rubber Chemistry of the Chemical Institute of Canada held a meeting on June 5 in Windsor, Ont., as part of the Institute's thirty-sixth annual conference on June 4-6. The Prince Edward Hotel was conference headquarters, and the technical sessions were held at Assumption College. Nearly 1,000 members and guests attended the general conference, which included technical sessions, plant trips, a golf tournament, the presentation of awards, and a special ladies' program.

The Rubber Division meeting, which attracted an attendance of about 100 members and guests, featured the presentation of eight technical papers.[1] In addition, the Division meeting included a business session, banquet, and a tour of the Polymer Corp., Ltd., and Cabot Carbon of Canada, Ltd., plants at Sarnia on June 6, jointly sponsored by the two companies.

New officers of the Division, elected at the business meeting, are as follows: chairman, G. D. Stevens, Goodyear Tire & Rubber Co. of Canada, Ltd.; vice chairman, E. Bolton, B. F. Goodrich Rubber Co. of Canada, Ltd.; and secretary-treasurer, F. R. Gorrie, Cabot Carbon. Newly elected executive committee members are: G. J. Baxter, Firestone Tire & Rubber Co. of Canada, Ltd.; H. K. Cunliffe, Dominion Rubber Co., Ltd.; and W. Gedye, Monsanto (Canada), Ltd. Outgoing chairman T. L. Davies, Polymer Corp., announced that consideration is being given to a joint meeting of the A. C. S. and C. I. C. Rubber Divisions in the Spring of 1956 or 1957, probably at Toronto or Montreal.

S. M. Cadwell, United States Rubber Co., guest speaker at the Division banquet, discussed "The Future Role of the Rubber Chemist." After describing the original efforts of chemists to gain acceptance in the rubber industry and the many new and improved polymers and compounding materials they have developed, Dr. Cadwell said that the future will see the rubber chemist changing into a chemist in the broadest sense of the word. The rubber industry is becoming more and more of a chemical industry, and rubber chemists are becoming combinations of colloid chemists, organic chemists, polymer chemists, and plastics chemists. As chemistry becomes more important to the rubber industry, the chemists themselves will become more and more important, Dr. Cadwell predicted.

Features of the Institute conference included the awarding of the society's medal for 1953 to E. W. R. Steacie, president of the National Research Council of Canada; a luncheon on June 5, which highlighted a talk on "The Incredible Chemical Industry and the Challenge of the Future," by W. T. Nichols, Monsanto Chemical Co. and president of the American Institute of Chemical Engineers; and the annual business meeting on June 4, at which new officers were elected for the coming year. The new officers are: president, J. W. T. Spinks, University of Saskatchewan; and vice president, E. R. Rowzee, Polymer Corp.

Papers given before other divisions of the Institute of interest to rubber and plastics technologists follow: "Measurements of the Diffusion Coefficients for Polyvinyl Acetate in Acetone, and for Polyisobutylene in Cyclohexane," J. Kelly and A. T. Hutcheon, McMasters University, Hamilton, Ont.; "Electrical Behavior of Vinyl Acetal Polymers," T. H. Sutherland and B. L. Funt, University of Manitoba, Winnipeg; "The Determination of Particle Size of Latex by Light Scattering Techniques" and "A Review of the Applications of the Electron Microscope to Studies of Synthetic Rubber," W. Rupar and H. L. Williams, Polymer Corp.; "Latest Developments in Polyvinyl Acetate Emulsion Paints," W. E. Smith, Canadian Resins & Chemicals, Ltd., Montreal; and "Studies of Film Formation of Synthetic Latices," R. H. Lalk, Dow Chemical Co., Midland, Mich.

[1] For abstracts, see our May, 1953, issue, p. 218.

Six-Speaker Symposium

THE June 15 meeting of the Elastomer & Plastics Group, Northeastern Section, A. C. S., continued the annual practice of presenting a Symposium of Short Subjects consisting of six talks on various topics of interest to the Group. More than 80 members and guests attended the meeting, held at Massachusetts Institute of Technology, Cambridge, and preceded by a dinner at Smith House. Vice Chairman J. M. Hussey, Goodyear Chemical Co., presided over the meeting, and the speakers were introduced by the program chairman, E. J. Walz, Godfrey L. Cabot, Inc.

The first talk was on "Coating Metal and Ceramics with Teflon," by J. H. Hendrick, American Durafilm Co. The object to be coated must first be purged at 750° F. to remove volatile materials, then sand or vapor blasted to produce a matt finish, and finally sprayed with an aqueous dispersion of Teflon. The coating thickness must not exceed 0.001-inch; thicker coats form a mud that sags. The coating is air dried to remove the water, and the resultant Teflon powder sintered to give a continuous film. Thicker coatings can be obtained by repeating this process, and as many as 15 coats have been applied to some objects, the speaker said.

The second speaker, D. P. Norman, New England Spectrochemical Laboratories, discussed "The Spectroscopic Analysis of Organic Polymers in the Glow Discharge." Dr. Norman described spectroscopic techniques which have proved valuable in empirical studies of the curing times and temperatures of commercial polymers; the detection and quantitative determination of amino catalysts in plastics; and the identification of resin coatings on papers and textiles.

D. W. Kirkpatrick, Boston Woven Hose & Rubber Co., was the third speaker, and his subject was "The Rotocure." The talk covered the development, design, installation, and operation of the continuous vulcanization machine used for curing belting, matting, packing, and other continuous lengths of sheet materials.

"New Pigments for the Rubber and Plastics Industries" was the topic of the fourth speaker, E. M. Dannenberg, Godfrey L. Cabot. The preparation and properties of Aerosil and Alon, Cabot's forms of ultra-fine silica and alumina, respectively, were discussed. Aerosil finds application in rubber and silicone rubber compounding. In the latter case tensiles up to 900 psi, and elongations up to 500% are readily secured, but tear resistance is poor, and the stocks are stiff. If Alon is used, the modulus is very much lower, but the same tensiles are possible with very good tear resistance.

The fifth speaker was Fritz Rosenthal,

Nashua Corp., who dealt with "Synthetic Resins in the Paper Converting Industry." Dr. Rosenthal described the inroads which synthetic resins have made in the industry, replacing the glues, dextrins, and starches used in gumming, and the waxes used for coating of packaging papers.

The final talk, "Rheology of Rubber Solutions and Suspensions," was given by Louis Leaman, Magic Chemical Co. Data secured with the Brookfield viscometer can be used to separate properly made cements and solvent solutions from faulty preparations. The instrument can be used to provide superior control data in the precise reproduction of exact cement characteristics, but obtaining and interpreting the data require experience, Dr. Leaman stated.

Rubber Developments Panel

A FOUR-SPEAKER discussion on "What's New in Elastomers" featured the May 22 dinner-meeting of Chicago Rubber Group, Inc., held at the Morrison Hotel, Chicago, Ill., with 195 members and guests attending. Edward Martin, Williams-Bowman Rubber Co., acted as discussion leader, and the speakers and their general topics were as follows: silicone rubbers, George Konkle, Dow Corning Corp., and B. B. White, General Electric Co.; polyacrylates, Roger Bascom, B. F. Goodrich Chemical Co.; and Hypalon, B. W. Fuller, E. I. du Pont de Nemours & Co., Inc.

Mr. White traced the development of silicone rubbers from the initial "cheesey" polymers to the present grades. A special silicone is available for low-temperature flexibility down to —120° F. and may be plasticized to maintain its properties up to 500° F. A new silicone has recently been made available which has lower compression set and mold shrinkage than general-purpose grades and which can be used in standard rubber molds. Another new development is a mixture of silicone and Teflon which gives high tear resistance and lower volume swell, but is difficult to process. In the compounding of silicone rubber, the usual vulcanizing agents are benzoyl peroxide and tertiary butyl benzoate. For fillers it is customary to use diatomaceous earths, inorganic oxides, calcium carbonate, fumed alumina, and precipitated silicas.

Mr. Konkle, who described the development and the use of Dow Corning's Silastics, noted that the major problems are low strength and low building tack. Vulcanization is easy; after a primary cure the rubber is given a secondary cure in an air oven. For minimum compression set it is desirable to use a long overcure. The most important properties of the Silastics are excellent heat stability, good low-temperature flexibility, good electrical properties, and resistance to outdoor weathering.

Mr. Bascom, speaking on polyacrylate rubbers, said that their outstanding properties are resistance to temperatures up to 350°F., resistance to oxidation at high temperatures, resistance to flex cut growth, and resistance to sunlight, ozone, and oil. The rubbers are usually vulcanized with Trimene Base. They may be modified with sulfur or sulfur-containing accelerators to improve aging, but cure is retarded and compression set suffers. Alkaline fillers must be used, and lubricants may be added to improve processing. Applications for the rubbers are mechanical goods exposed to oils in service, especially where sulfur is present.

Mr. Fuller spoke on the compounding, processing, properties, and applications of Hypalon. The addition of rubber to Hypalon will improve its tack, lower the compression set, and give better processing. It is possible to improve the modulus of butyl rubber by the addition of 5-10% Hypalon. Principal applications for the polymer include acid, water, and garden hose; white sidewall tires (in a 30-70 blend of Hypalon and rubber to prevent cracking); farm tires; tank linings; footwear finishes; and miscellaneous mechanical goods and sponge.

In the business meeting preceding the discussion, results of the recent mail balloting for new officers and directors of the Group were announced. Those elected were: chairman, A. J. Hawkins, Jr., du Pont; vice chairman, Stephen M. Lillis, Victor Mfg. & Gasket Co.; secretary, A. L. Robinson, Harwick Standard Chemical Co.; treasurer, L. W. Heide, Western Felt Works, Acadia Synthetic Products Division; directors (manufacturers), Harold Stark, Dryden Rubber Division, Sheller Mfg. Corp., and J. B. Braden, Industrial Rubber Goods Co.; and directors (suppliers), William Cary, Cary Co., and John Meyer, Herron Bros. & Meyer, Inc.

The drawing for the door prizes was won by Jerry Donyer, Farrel-Birmingham Co., Inc., and M. E. Jones, Marbon Corp.

Groups Enjoy Outings

Diversified Program for SORG

THE Southern Ohio Rubber Group held its annual summer outing on June 6 at the Inland Activities Center, Dayton, O. The outing was well attended despite the rain that began late in the afternoon, and 109 members and guests took part in the program which included athletic events, card games, a golf tournament at Madden Park, and picnic refreshments.

First-prize winners in the golf tournament were: blind bogey, R. E. Antheil, Inland Mfg. Division, General Motors Corp.; low gross, R. B. Sucher, Marbon Corp.; low net, Frank Novey, Inland; and high gross, Mark Deal, Inland. Prizes were also given to second- and third-place winners in the tournament, and the outing concluded with a drawing for 108 door prizes contributed by the Group and by 12 supplier companies.

Afternoon Program for N. Y.

EXCELLENT weather featured the annual summer outing of the New York Rubber Group at Sundance Lodge, Caldwell, N. J., on June 11. Approximately 165 persons attended the affair, which was arranged by a committee headed by G. W. McComb, Rubber Corp. of America. Good participation in the various activities, athletic and social, and ample food combined to make the outing a complete success.

Two complete softball games, the final scores of which were 5-4 and 8-7, featured the athletic events and contributed to much of the excitement of the day and subsequent weariness of the participants. Other contests of the afternoon saw the following men emerge as prize winners: darts, H. Peters, Bell Telephone Laboratories; horseshoe pitch, W. Lamela, Okonite Co., (first prize), and M. R. Buffington, Lea Fabrics, Inc.; baseball throw, L. Komar, Titanium Pigment Co.; boccie, G. Jantinen, S. J. Pike & Co., and G. McNamara, Pequanoc Rubber Co.; and golf-driving, E. T. McBride, Burgess Chemical Co.

As was decided after the last outing, the evening dinner was eliminated by continuing the buffet lunch, with sufficient liquid refreshments, throughout the afternoon. The experiment was apparently successful since hunger pains were with few, if any, of the Group when the outing dispersed at 6:00 p.m.

Good Day for Washington

PERFECT weather and a full program of activities attracted an attendance of more than 100 members, guests, and their families at the annual field day of the Washington Rubber Group, held on June 5 at the Annapolis Roads Club. W. J. Sears, Rubber Manufacturers Association, acted as general chairman, assisted by C. C. Miller, RMA, and the subcommittee chairmen were: tickets, P. S. Greer, RFC; prizes, G. M. Riveire, Goodyear Tire & Rubber Co.; special events, T. R. Scanlan, Gates Rubber Co.; and dinner, J. T. Cox, Jr., consultant.

The outing concluded with a dinner and the distribution of contest and door prizes. Winners in the men's golf tournament were: low net: L. E. Spencer, Goodyear; low gross, H. D. Brown, NPA; high gross, Mr. Scanlan; putting contest, R. J. Devereaux, B. F. Goodrich Co.; driving contest, Nels Kruger; hole-in-one contest, James Rice; and most sixes, I. R. Kolman, Belko Corp. First prize winners in the other activities follow: horseshoes, E. G. Holt, NPA; ping pong, Mr. Devereaux; and bridge, Mrs. B. F. Grimm. In addition, prizes were also given to runner-ups in the various contests, winners in the separate ladies' golf and ping-pong tournaments, and to winners in the various special events contests. A total of 28 door prizes was distributed through the donations of some 23 rubber and supplier companies.

Record Crowd for R. I. Club

A NEW record high of 210 members and guests attended the annual summer outing of the Rhode Island Rubber Club, held June 4 at the Metacomet Golf Club, East Providence, R. I. Golf was the order of the day, and first-prize winners follow: low gross, W. A. MacGuire, United Carbon Co.; low net, E. L. Parent, Best Thread Co.; kickers' handicap, T. J. Conlon, Dow Chemical Co.; putting contest, Miles Powell, Jr., E. I. du Pont de Nemours & Co., Inc.; nearest to pin on fifth hole, J. Morehead, Spencer Thermostat Co.; nearest to pin on seventh hole, J. Davies, Arnold Hoffman & Co., Inc.; nearest to pin on tenth hole, J. E. Hart, Taylor Instrument Cos.; most sixes, H. L. Lawrence, du Pont; most sevens, J. M. O'Grady, Respro, Inc.; most eights, Alan Bryant, Binney & Smith Co.; high gross, Herman Gadon, Crescent Co.; high net, J. R. Powell, D. H. Litter Co.; and longest drive, Allen Midyette, C. F. Church Co.

Other prizes for runner-ups were also given in the golf tournament, and each person attending the outing received a door prize made possible by the contributions of almost 100 individuals and companies.

A brief business session was also held, at which a revision to the Club's by-laws was approved wherein one new director will be elected annually for a five-year term, replacing the previous procedure requiring two new directors who served three-year terms.

Acrylonitrile Discussed

AT A recent meeting of the Chemical Market Research Association, A. J. Weith, American Cyanamid Co., presented a paper on acrylonitrile which covered the past, present, and expected future of the product.

The commercial history of the material from its first usage in 1940 in the production of nitrile rubber was discussed, including the initial method of production from coke, lime, and ethylene. The economics of that process, however, dictated that some other production method be devised, and work performed in Germany in this respect indicated the feasibility of using natural gas as the raw material. The process consists of partially oxidizing methane to acetylene; the off-gases from this operation are processed to form ammonia, which in turn is reacted with methane to yield hydrogen cyanide. Acetylene and HCN are then reacted to form acrylonitrile.

In 1952, American Cyanamid began construction of a plant for the production of this compound by this method. The plant, 18 miles up the Mississippi from New Orleans is expected to be in operation by early 1954. Its products will be derivatives of acetylene, HCN, and ammonia, foremost of which will be acrylonitrile and ammonium sulfate.

Monsanto Chemical Co. and Union Carbide & Carbon Corp. are also producing acrylonitrile, the former from natural gas, and the latter from ethylene oxide and HCN. The B. F. Goodrich Co., furthermore, plans to erect an acrylonitrile facility at Calvert City, Ky., for its production from synthetic HCN and acetylene generated from calcium carbide.

The major portion (60%) of current acrylonitrile production is used for fibers such as Orlon, Dynel, and Vinyon N. Production capacity is constantly increasing, with an annual capacity of 200 million pounds expected by 1955. The current price of 43¢ a pound is expected to fall as a result of Cyanamid's new plant, which has established a price of 31¢ a pound when the facility goes into operation.

Increased usage of acrylonitrile as a chemical intermediate is expected. The structure of the molecule which contains two strong points of reactivity, the double-bond and the nitrile group, allows for chemical combination of three varieties: two involve either point separately, and one involves both points. The reaction involving the nitrile group only can produce acrylamide and acrylic acid, the former by the acid hydrolysis of acrylonitrile going through acrylamide sulfate, and the latter by the direct hydrolysis of acrylonitrile or from acrylamide. The double-bond reaction yields succinonitrile, thiodipropionitrile, and propionitrile. Both points react together in the formation of beta alanine, ethylene bisoxy propylamine, and tetramethylene diamine. All of these compounds are of interest to research chemists in the resin and plastics fields.

Cadwell Speaks at Thiokol

S. M. CADWELL, director of research and development, United States Rubber Co., was the speaker at the June 10 meeting of the Thiokol Technical Club held at the Trenton, N. J., plant of Thiokol Chemical Corp.

About 100 visitors and 60 members of the company enjoyed a pleasant evening, which began with a social hour at 5:00 p.m. followed by a buffet supper and Dr. Cadwell's talk. The lawn in back of the company's plant provided the setting for not only the social hour and dinner, but in this instance for the talk by the speaker of the evening.

This talk was entitled, "The Future Role of the Rubber Chemist," and was the same as that presented before the Division of Rubber Chemistry, C. I. C., in Windsor, Ont., June 5.[1]

At the conclusion of the talk the audience remained for at least an hour in several groups discussing the ideas expressed by Dr. Cadwell, as well as many other matters.

[1] See p. 501.

Interchangeable Oils in GR-S Masterbatches

IN A memo on June 16, the Office of Synthetic Rubber, RFC, announced that certain oils will be used interchangeably in the production of GR-S oil masterbatch polymers, effective July 1. Shell SPX 97 and Sundex 53 will be used interchangeably; likewise Dutrex 20, Califlux TT, and Philrich 5 will be interchangeable. Circosol 2-XH, which is relatively non-staining, will not be interchanged with any other oil at this time.

New GR-S designations have been given to the previously X-numbered oil masterbatch polymers[1] which incorporate this feature of interchangeability. The new designations follow:

New GR-S Designation	Polymer Replaced
1703	X-745
1704	X-743, −744
1705	X-739, −740
1706	X-741, −742
1707	X-735
1708	X-718
1709	X-724, −725
1710	X-736, −737
1711	X-727, −729, −731
1712	X-726, −728, −730
1801	X-746

While RFC will not accept orders for polymers which specify a particular oil, it will identify the processing oil used in a polymer on both the Quality Report which accompanies each shipment and the container itself. With bareback shipments of black masterbatches, the identification will be embossed on each bale. The following oil identification letters will appear as suffixes to the polymer numbers:

	Identification
Circosol 2-XH	H
Sundex 53	N
Shell SPX 97	L
Dutrex 20	D
Califlux TT	T
Philrich 5	P

A price list for the new GR-S polymer designations is appended to the rubber market review in this issue.

[1] Described in our Mar. issue, p. 808.

Hypalon Group Topic

A TOTAL of 143 members and guests of The Los Angeles Rubber Group, Inc., attended the afternoon technical session of the March 3 meeting, held at the Hotel Statler, Los Angeles, Calif., and heard R. A. Osten, E. I. du Pont de Nemours & Co., Inc., speak on "Utilizing the Properties of Hypalon." Dr. Osten's talk covered the composition, compounding, curing, properties, and applications of Hypalon chlorosulfonated polyethylene; detailed information on this rubber has appeared in articles in our March, April, and June issues.

The evening dinner-meeting was sponsored by W. J. Voit Rubber Co., and 303 members and guests of the Group were present. Page Parker, of Voit, presided over the company's portion of the program and introduced the dinner speaker, Nelson E. Mathison, the nation's outstanding skin-diver (underwater hunting equipped with only fins, masks, spear, and knives). Dr. Mathison described some of his experiences in skin-diving, showed a color film of some adventures, and displayed samples of his equipment.

Chairman D. C. Maddy, Harwick Standard Chemical Co., presided over the brief business session at which reports were given by the various committee chairmen of the Group. The meeting closed with a drawing for door prizes contributed by Voit and won by Ed Grey, guest; J. W. Arensmeyer, Golden West Rubber Products, Inc.; J. H. McSparran, Durethene Corp.; and E. C. McLaughlin and D. W. Burson, both of H. M. Royal, Inc.

Prize winners at the Group's first golf tournament of the year, held April 10 at the Hacienda Country Club, were as follows: blind bogey, Jack Cheldin; low gross, C. H. Wallace, United States Rubber Co.; low net, D. D. DeLong, Advance Rubber Stamp Co.; longest drive, W. B. Higbee, Southwestern Rubber Co.; closest to pin, C. W. Erickson, Pacific Hard Rubber Co.; longest putt, R. N. Phelan, Atlas Sponge Rubber Co., most fives, Lee Kirkwood; and most sixes, Arnold Paulk.

Film-Wrapped GR-S Purchases

ON JUNE 5 the Office of Synthetic Rubber, RFC, announced that, effective with purchase orders for July, companies desiring to purchase GR-S wrapped in film and packed in large cardboard containers, instead of the standard talc and paper-bag package, place the following statement on their purchase orders:

"It is requested that the material covered by this purchase order be film wrapped and packed in large cardboard containers, with the understanding that the purchaser or his agent hereby waives all rights to claims for damages due to this method of packaging."

Since the film-cardboard package is purely experimental, the RFC does not honor claims for damages due to such packaging and has been securing waivers of rights to claim from purchasers requesting such packages. The new ruling, incorporating a waiver in the purchase order, will simplify and expedite all future purchases of the film-wrapped one-ton GR-S packages. Purchase orders not showing the waiver will be filled with GR-S packaged in the standard container.

Celanese Corp. of America, chemical division, New York, N. Y., has opened a new sales office in Cleveland, O., under the direction of R. A. Schwab, sales district manager, formerly in charge of the Detroit office closed July 1.

NEWS of the MONTH

The House Armed Services Committee unanimously reported the Shafer Bill on June 17, and passage by July 1 seemed likely. Meanwhile the Senate Banking and Currency Committee began hearings, June 24, on the Capehart-Bricker Bill version of synthetic rubber plant disposal. Nine to 11 months was the indicated time the bills would allow for disposal, or by June 1 or August 1, 1954, or the alternative was for the government to continue as owner-operator of the synthetic rubber industry for an indefinite period.

Sale of butyl rubber and petroleum butadiene plants appeared to present no difficulty, but sale of the copolymer plants under conditions satisfactory to both government and industry still looked like an even bet.

Some of the requirements likely to be included in the disposal bill, if passed this summer, are: (1) sale of at least 500,000 tons of anuual capacity of GR-S; (2) a return to the government of about $275 million from the sale of the plants; (3) the Disposal Commission to be appointed by the President, and Congress to have 30 days to reject the disposal program arrived at, and on an all-or-nothing basis; (4) assurance of a competitive pattern that would provide adequate protection for small users; (5) ample time to be allowed for the smaller companies to arrange for financing so that they can bid competitively.

A GR-S inventory of 200,000 tons by the Summer of 1954 to be used to prevent a shortage during the actual disposal of the plants was objected to by the Budget Bureau and the House Armed Services Committee. Inventory accumulation by the consuming industry was recommended; while at the same time an inventory of about 70,000 tons might be arranged for by the Reconstruction Finance Corp.

With the end of the National Production Authority on July 1, 1953, the Commerce Department plans establishment of 25 industry divisions and establishment of new "industry councils," including those for the rubber industry, with broader functions than those of the industry advisory committees of the NPA.

The House Ways and Means Committee reported the Administration sponsored Customs Simplification Bill, but with provisions for retaining the American selling price as the basis for valuation for imposing duties on imported rubber footwear and several other items.

The House Armed Services subcommittee on defense activities headed by Rep. William E. Hess (Ohio), issued a report May 28, condemning the government's tire testing program at Camp Bullis, Tex. Official comment by the Reconstruction Finance Corp. and Army Ordnance is expected soon.

Harry E. Humphreys, Jr., president, United States Rubber Co., predicted on June 23 that the rubber industry would set a new record of 1,400,000 tons of new rubber consumed in 1953 and that 96,000,000 passenger and truck tires will be made before the end of the year.

The United Rubber Workers of America, CIO, opened wage negotiations with the Firestone, Goodyear, and Goodrich companies during June.

As we were going to press, it became known that the House had approved the Shafer Bill by a voice vote, on June 25, after rejecting on a roll call vote, 317 to 58, a move to send the bill back to its Armed Services committee. An amendment raised from 3% to 3.5% the interest the government will receive on mortgage payments from plant buyers.

Washington Report by Arthur J. Kraft

House Expected to Pass Shafer Bill by July 1; Disposal Law by July 31 Possible

On June 17 the House Armed Services Committee unanimously reported a bill authorizing the government to make an effort to sell its synthetic rubber plants to private industry, and the Senate Banking and Currency Committee was about to hold hearings on a somewhat similar measure of its own. Passage of the Shafer Bill in the House was expected before July 1. The House committee had taken testimony from 22 witnesses over the previous fortnight—testimony which filled 237 pages of a finely printed record. All the witnesses—representing government, industry, and organized labor—endorsed making an effort to sell the plants at this time. The House bill contemplates transferring the plants to private owners—provided a satisfactory disposal program can be worked out between government and industry at the bargaining table—by June 1, 1954—only nine months after the actual sales effort is expected to be launched. The Senate bill, as introduced by Chairman Capehart (Rep., Ind.) and Senator Bricker (Rep., Ohio) on June 4, contemplates final transfer about July 31, 1954, or 11 months after the sales effort begins. These time-tables, of course, assume enactment of the "enabling" legislation before Congress adjourns on July 31. It is assumed that whoever is given charge of the disposal program, whether an independent Commission, as provided in the House bill, or existing Administration agencies, as in the Senate bill, will start work September 1.

Nine or even 11 months is a very short period to accomplish the complex task set out in these disposal bills. The government will be charged with the job of breaking up an integrated, going concern into a number of competitively operated units, which together must be at least as strong as the present government monopoly enterprise. At the same time it must assure that the interests of the public and all consumers of synthetic rubber are served equally as well after disposal as before. Finally it must manage to get assurances that a private rubber producing industry will work out this way, while demanding that industry put out a heavy chunk of cash for the privilege of doing so. If any of these objectives cannot be reached, disposal will not be permitted, and the government will be continued as owner-operator of the synthetic rubber industry for at least two more years, and possibly on terms which will be less favorable than in the past to those who use synthetic rubber.

Whether the universal hope of the world's rubber community that a satisfactory disposal program can be achieved will rest on the ability and earnestness of the government officials named to negotiate the plants and on those private firms which appear the most likely purchasers of the plants. From a practical standpoint a large part of the responsibility will fall upon the major rubber manufacturers—the "Big Five"—who must buy some plants if a disposal program is to be developed and who are expected to end up with at least half the GR-S capacity sold. Each of these five industry leaders had indicated in the hearings before the House committee that it was interested in making an offer to buy one or more plants.

Their prepared statements and their responses to committee questioning left no certainty, however, as to their plans for entering bids for copolymer plants. On the other hand the Congressmen felt more assured over the prospect of selling—on the terms laid down by the legislation—the butyl and petroleum butadiene plants. Petroleum companies came forth at the hearings with statements indicating strong interest in these plants. It seems likely—strictly on the basis of impressions drawn from the testimony—that disposal of the butyl plants at favorable prices is virtually assured, that the prospect for disposal of the butadiene plants is almost as favorable, while disposal of the copolymer plants is still a betting proposition—either way.

Plant Capacity of 500,000 Tons a Year Required To Be Sold

The stiffest condition for disposal is the requirement that enough plants must be sold to assure that private industry will be capable of turning out at least 500,000 long tons of GR-S a year. This means that the disposal authorities must button up, in a four- to six-month negotiation period, the sale of well over half the government's present GR-S a year. The Senate bill, as introduced, requires 400,000 tons' capacity must be sold. At the House hearings Phillips Petroleum indicated it would bid for the 66,000-ton plant it now operates for the government at Borger, Tex. Copolymer Corp. indicated it would do likewise for the 49,000-ton plant it operates at Baton Rouge, La. It is assumed that U. S. Rubber will want to buy the Naugatuck, Conn., latex plant, a 22,200-ton facility, and encouragement may be given to have Kentucky Synthetic—a group of smaller firms—buy the 44,000-ton plant it operates at

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Louisville. Together, these account for 181,200 tons of the 500,000-ton capacity needed to permit disposal.

The apparent deficit of 318,800 tons can be filled easily, but only if the large rubber companies participate in a big way. While there may be other bidders from the ranks of the petroleum or chemical industries, none but Phillips has shown an interest in copolymer plants, and it seems most doubtful, in any case, that these two industries want to run the country's finished rubber plants. Some calculation can be made of the degree of participation required of the major rubber firms, although this is most speculative. To begin with, it is assumed that the largest plant of all will not be sold, the 122,000-ton facility at Institute, W. Va. The most likely prospect is that each of the "Big Five" enters a bid for the largest plant he now operates—U. S. Rubber for Port Neches (89,400), Goodrich for Port Neches (90,000), Firestone for Lake Charles (99,600), Goodyear for Houston (99,600) and General for Baytown (44,000). This makes a total of 422,600 tons. Thus the 318,800 remainder of the disposal requirements can be attained if no more than four of these possible bids can be developed in satisfactory sale contracts. By the same token, if more than one of the five fails to pan out, the entire disposal effort stands to fail.

House Armed Services Committee Indicates $275 Million Price Tag

While other questions are involved, it seems apparent that a major yardstick which the disposal authorities must use in deciding whether to accept or reject a bid is the price offered for the plant. Under the proposed legislation each plant must be sold for "full, fair value." No one has defined what this means, but it may be safe conjecture to state that Congress intends that the government receive, on each plant sold, at least 70% of the government investment—the cost, including original investment plus additions, less retirements, as of December 31, 1952. The nine copolymer plants listed above represented a cost of $115,834,000; the eight petroleum butadiene plants, a cost of $204,472,000; the butyl plants, a cost of $53,181,000; and the styrene plant, $15,131,000. If 70% represents the least Congress will permit, sale of the above plants must bring at least $271,600,000 into the Treasury.

This is within shouting distance of the $300 million which Representative Shafer called a "fair and adequate price" in a letter to his constituents on April 19. During the recent House hearings, Mr. Shafer and the subcommittee's counsel, John R. Blandford, made several points about this question of disposal price, to wit: The plants have a "high value." Congress would expect a return of 75 to 85%, and Congress should say nothing about possible prices, because the only way to determine "full, fair value" is to see what a "willing buyer will offer a willing seller." That, Mr. Blandford insisted toward the close of the hearings, is what "full, fair value" means.

Shafer and Blandford stated rather bluntly early in the hearings that it is probable relatively few rubber consuming companies are in a position to buy and operate a synthetic rubber plant. They subjected witnesses representing present operators—primarily those of the "Big Four" and Phillips—to a probing aimed at getting them to make assurances, in the record, that they intend to bid, and bid high, for the copolymer plants. They failed to get specific commitments of high bids at the hearings. In a warning addressed to Phillips Petroleum Co., Mr. Blandford pointed to the "obligation" resting on a company which might be the sole bidder for a facility. Phillips, he said, probably will find no competition for the butadiene and copolymer plants at Borger because Phillips controls the feedstocks in that area. If it bid "too low," Mr. Blandford told the Phillips' representative, "you might be in the embarrassing position of jeopardizing the disposal program."

There was a good deal of fencing on issues which would have a bearing on the prices paid for the plants. The Congressmen expressed a firm conviction that the government's prospects of a high return would be best assured by keeping the bidding open to everyone and granting no special favors to any group. Those rubber consuming companies which now operate plants came forth with a variety of suggestions aimed at getting more advantageous terms. Some suggested that present operators be given preferential treatment over other bidders, and one suggested that the plants be sold to rubber companies only. Some sought special tax benefits. Several wanted the government to build a synthetic rubber stockpile—a device scored by the subcommittee as a price weapon aimed at depressing the price of natural rubber.

Shafer vs. Capehart-Bricker Bill

There are a number of differences between the Shafer (House) bill and its Senate counterpart. Most are relatively minor. The two key differences involve the questions of who shall conduct the disposal program, and who shall take final responsibility for it. Under the House bill the President would name a three-member Commission to handle disposal; the members of the Commission would be outstanding citizens having no present connection with a government agency or with a rubber, petroleum, or chemical company. In contrast, the Bricker-Capehart bill would give the job over to a three-member government board, consisting of the Secretary of the Treasury, as chairman, the Attorney General, and the General Services Administrator. The actual negotiations would be conducted by a salaried agent named by the board.

The other prime difference—the question of ultimate responsibility—shapes up this way: Under the Shafer bill the Disposal Commission would report to Congress all the contracts it has negotiated, plus its recommendations and those of its adviser on anti-trust aspects, the Attorney General. Congress would have 30 days in which to reject the program, on an all-or-nothing basis. The Bricker-Capehart bill, on the other hand, requires the disposal agent to make a similar report, with recommendations, to the administrative board, and that board would have 30 days in which to reject or accept it. There is no provision for Congressional review in the Bricker-Capehart bill.

In his hearings held in the early part of June, Shafer time and again argued against the approach adopted in the Bricker-Capehart bill of putting negotiations in the hands of existing federal agencies.

No matter which agency was named, government rubber experts and others from other agencies would want a part in the decisions. This fact, he asserted, would lead to "endless subcommittees," and disposal would bog down in inter-agency "bickering," killing all chances of early completion of a program. An independent commission, on the other hand, he argued, would bring a fresh, if untutored, approach to the problem, could draw upon expert advice from whatever sources it wished, and would be free from the pressures of bureaucracy and the sharp polarization of conflicting views on rubber matters which has developed within the government. He conceded, of course, the success or the failure of the disposal program would rest to a great extent on the ability of the President to find commissioners who could bring a high degree of intelligence to their complex task. They would have to be quick learners, since the Shafer bill would give them only about four months between the time they begin negotiating and submit their report to Congress.

U. S. Rubber strongly and specifically endorsed Mr. Shafer's commission approach, in contrast to the Bricker-Capehart proposal.

During the hearings several Democratic members of the committee peppered witnesses with questions in probing for a soft spot in the disposal argument. If one was found, no one advertised the discovery. Several Democrats, who appeared lukewarm about disposal, when the hearings began, were strongly advocating it when the hearings closed. The Shafer bill, with amendments, was approved unanimously (22 to 0), with the ranking Democrat on the committee, Carl Vinson of Georgia, making the motion for reporting the bill, and recommending its passage by the House. The amendments adopted were designed primarily to protect small consumers of rubber, who, unable to buy synthetic rubber plants, expressed fears over having a secure supply of synthetic rubber when the plants are transferred to private companies—particularly to large rubber companies, who fabricate products in competition with smaller companies. The Democrats on the committee displayed the most concern, in their questioning of witnesses, over the fate of the small businessman, and it was a Democrat, Rep. E. Celler (New York), a member of the House Judiciary committee, who appeared before the Shafer Armed Services subcommittee to urge strong provisions to assure against control of synthetic rubber production by the rubber industry's "Big Four." Mr. Celler in his testimony showed himself well-versed in the history of anti-trust suits involving the rubber industry. Most of his testimony was a recitation of that history.

Shafer acknowledged that disposal raised problems of protecting the smaller consumer's interests, and he promised small consumers that his committee would examine the disposal report to make certain that a competitive pattern for the synthetic rubber industry was assured which would in turn provide a reliable source of synthetic rubber for the many small users.

Shafer and his colleagues drew comfort from the statement of Ross Thomas, vice president of Phillips Petroleum, who told the subcommittee that his company "wishes to purchase the Borger, Tex., butadiene plant and the adjacent copolymer plant, both of which it is operating for the government. Phillips," he continued, "is not a manufacturer of rubber goods. Phillips expects to sell its synthetic rubber output to rubber industry users, and will provide an independent source to those companies not having a captive or affiliated supply of synthetic rubber."

With his company in the field, Mr. Thomas said, "Competition would be stimulated, and a reliable, independent source of supply of the latest and best polymers would be provided to hundreds of intermediate and smaller users in the rubber industry." Phillips, he added, expects to "augment our already large synthetic rubber research activities and to continue to develop improved polymers and latices." The company has "no plans and no intention to enter the production of rubber goods," Mr. Thomas declared.

This statement cheered the committee and drew audible sighs of relief from the large Akron delegation attending the hearings.

Here's a rundown of the highlights of other testimony presented during the hearings before the House Armed Services subcommittee:

RFC Supports Disposal by Interagency Commission

Kenneth R. Cravens, Administrator, and Morton E. Yohalem, his Special Deputy, representing the RFC, suggested that the Secretaries of Treasury and Commerce and the Director of the Office of Defense Mobilization be put in charge of disposal, with actual negotiations being carried out by RFC, subject to their direction. They said the bill should be amended to provide "bidders with adequate protection against the possibility of being required at a subsequent date to defend their purchases against" anti-trust law violation charges from the Justice Department, and possible suits aimed at divesting them of ownership of any plants they might purchase under the disposal program. The RFC witnesses also criticized the interest rate of 2.5% on first money mortgages available to plant purchases as too low, a "subsidy" to the purchasers. They further declared that any rubber held by RFC at the disposal transfer date should be sold to buyers of the plants rather than allocated on a pro-rata basis to the hundreds of consumers of GR-S, as the bill proposed.

Mr. Yohalem predicted a temporary period of disorder following transfer and said this would be prolonged if the new plant owners found their facilities emptied of inventory. They would have to fill pipelines and work out their pricing policies while competing with the government selling rubber at fixed prices.

Mr. Cravens suggested the committee delete from its bill the "inflexible yardstick" of requiring that sale of any plants hinge on disposal of capacity sufficient to produce 400,000 tons (later raised to 500,000 tons) of GR-S annually. The provision of the bill requiring Congressional review before disposal is finalized makes the guaranteed-tonnage figure unnecessary, he said.

Frederic E. Bates, Jr., chief of the Rubber Branch, Defense Department Munitions Board, said the Defense Department supports disposal at this time and assured subcommittee members that the government's stockpile goal for natural rubber is almost fully completed and is adequate, if not too large.

GR-S Stockpile of 200,000 Tons Asked

P. W. Litchfield, chairman, Goodyear Tire & Rubber Co., endorsed disposal and said, "We are, and we are sure other prospective purchasers are, willing to pay the full fair value for the facilities which we may acquire through the disposal program."

He made an "urgent request" that the legislation provide all-out production of GR-S prior to disposal so that a government inventory of 200,000 tons will be held to offset possible shortages after the plants are transferred. He also urged "with all the strength at our command" that the government build up a separate 200,000-ton stockpile of synthetic rubber to be held against the possibility of serious interruption in supplies of natural or synthetic rubber in event of war or some other unforeseen hazard.

Stanley Barnes, head of the Justice Department's anti-trust division, stated he was willing to advise the disposal commission on anti-trust aspects of proposed sales, but said he wanted the bill drafted to give him adequate time to peruse the contracts. He suggested a 60-day period for anti-trust checking, and the bill was amended to provide a 45-day period.

Everett Morss, president, Simplex Wire & Cable, and John Bierer, president, Boston Woven Hose & Rubber, both expressed confidence that small rubber consumers will be assured continued supplies of synthetic rubber even if most of the plants are sold to large rubber fabricators with whom they compete. Mr. Bierer said he always found that the "Big Four" are "square dealers"; he has never been ill-treated by them and doesn't expect to be.

Future Research by Industry To Exceed Past Government Cost?

O. V. Tracy, vice president, Esso Standard Oil Co., said his company is prepared to bid at any time for the butyl plant at Baton Rouge; while Humble Oil & Refining Co., also owned by the same parent company (Standard Oil Co., N. J.), wants to buy the other butyl plant at Baytown. Mr. Tracy said this procedure would not result in monopoly dangers to the public because butyl will have to compete with other forms of synthetic rubber and natural rubber. Moreover, he stated, Esso is willing to license and provide engineering aid to other firms wishing to build butyl plants.

(Thiokol Corp. was later identified as one of the companies offered Esso butyl licenses and engineering "know how." Thiokol's president, Joseph Crosby, testified his company intends to build a butyl plant if it can get adequate financing. He also urged, in order to assure competition in sale of rubber, that a large number of the copolymer plants be sold to non-rubber consuming firms.)

Mr. Tracy warned that keeping the rubber plants under government stewardship would arrest development of synthetic rubber. He said private industry would spend a good deal more on research than the government has been spending. He estimated private research expenditures for synthetic rubber would run about $15 million a year, in contrast to the $40 million spent by the government in the 10 years since the program was launched. Esso spent $11 million on butyl research up to 1948, he revealed, and has been spending at a more rapid rate since then.

Rapid Tax Amortization Asked

John L. Collyer, president, The B. F. Goodrich Co., suggested that Congress agree that investors in rubber facilities be permitted to amortize them more rapidly than can be done under present tax regulations. His reasons for making this suggestion were: (1) obsolescence of the facilities through the development of new lower-cost producing facilities, or new and better rubbers which cannot be produced efficiently in the present facilities; (2) competition from producers of crude rubber; (3) competition arising from liquidation of government owned stockpiles of crude rubber.

He also said that the competitive position of the man-made rubbers in the future will, he believes, depend largely upon: (1) the selling prices of man-made rubbers which will partly depend upon the price obtained for the government owned facilities; (2) the extent to which the total world demand for new rubber may increase; and (3) the extent to which more crude producers make an effective effort to reduce costs.

The comprehensive study published by Goodrich, dated March 10, 1953, and entitled "The World and United States of America Rubber Situation," was inserted into the record, at Mr. Collyer's request.

Robert A. Winters, executive director, Rubber Heel & Sole Institute, urged that a strong effort be made to sell most of the copolymer plants to firms which do not consume rubber and particularly to avoid concentrating ownership in the "Big Four." His suggestion that the government continue operating those synthetic rubber plants it does not sell was criticized by the subcommittee's counsel as incompatible with disposal.

Concern Expressed for Adequate Synthetic Supply

Charles F. Johnson, of Endicott Johnson Corp., and representing five small rubber companies which are part of the group operating Kentucky Synthetic, said his group might be interested in buying a copolymer plant, and urged lower interest rates (1%) on the purchase money mortgage which the government would grant, under the bill, covering up to 75% of the purchase price. He showed great concern about the possibility of a shortage of synthetic rubber following disposal and recommended that disposal be made contingent on sales of sufficient GR-S capacity to produce 650,000 tons annually. Mr. Johnson, like many other witnesses before the subcommittee, cited the prospective growth in rubber demand, both here and abroad. While others, including the subcommittee's chairman, cited this to show the desirability of selling the plants now, Mr. Johnson also called attention to the possibility that supply would not keep up with demand if industry were not required to buy almost all the existing facilities. Under the proposed legislation, unsold plants would be put into emergency "standby" and not put up again for sale for another two or three years.

Shafer and a number of industry witnesses have pointed out that the rising trend of consumption will require the construction of additional synthetic rubber plants within a few years, a responsibility they would have devolve on private industry rather than on the government. Shafer also warned that if disposal fails to go through, the government will have to build the new plants—and this policy would most likely mean that synthetic rubber will be made a permanent nationalized industry.

J. P. Seiberling, president, Seiberling Rubber Co., strongly endorsed the Disposal Commission approach, as outlined in the Shafer Bill, and also asked more time for the smaller rubber companies "to get their financial house in order" so that they could bid competitively.

Cross-Licensing and Protection from Anti-Trust Action Urged

A. L. Freedlander, president of Dayton Rubber Co. and of Copolymer Corp., said the latter firm, a syndicate of eight rubber companies, wants to buy the copolymer facility it now operates at Baton Rouge. His suggestion that present operators be given preference in bidding for the rubber facilities drew sharp criticism from the subcommittee. The same response greeted his suggestions that all successful bidders be required to license future technical developments to other synthetic rubber plant operators and that the government build a stockpile of 200,000 tons of GR-S. The subcommittee's counsel, Mr. Blandford, said giving preference to present operators would negate the purpose of selling the plants on a bid basis—the purpose being to assure the highest return to the government—while a government stockpile of

GR-S—which Mr. Freedlander said would assure national security—would provide a "price weapon" against producers of natural and reclaimed rubber. The subcommittee, Mr. Blandford added, does not wish to take any action which would be to the detriment of natural or reclaimed rubber interests.

William P. Gee, of Texas Co., operator of a butadiene plant at Houston, urged that exemption from anti-trust action be provided for oil companies which may join together in making arrangements to supply butadiene to copolymer facilities. Mr. Gee predicted that disposal "will start in action highly competitive research and development work in synthetic rubber."

Protection of Small Consumers Emphasized

Thomas Robins, Jr., president of Hewitt-Robins, Inc., representing his firms and the 19 companies which are members of Kentucky Synthetic, said it is "most unlikely that small consumers will be "frozen out of their raw materials supply," regardless of who buys the plants. He predicted that competition will be strong in the sale of synthetic rubber, and sellers will be looking hard for buyers, both small and large. He also forecast that the disposal commission will be able to sell from 600,000 to 700,000 tons of GR-S capacity, well above the floor set by the Shafer and Bricker-Capehart bills. Mr. Robins suggested that the Disposal Commission be given broad discretion to permit changes in the composition of bidding combines after the bid deadline passes.

Roger McLean, an attorney from Sinclair Refining Co., said the government should aim for a high return on its plants, but that any delay in transferring the plants would result in a lower return. He said the plants will lose at least 10% a year in value through obsolesence.

J. E. Trainer, vice president, Firestone Tire & Rubber Co., urged that rubber consuming companies, particularly the present operators of the plants, be given preference over other bidders. His suggestion was not greeted warmly by the subcommittee. A similar suggestion was made by The General Tire & Rubber Co., in a letter to the subcommittee.

Ample Natural Rubber Said To Be Available

Frederick T. Koyle, a director of the Rubber Trade Association of New York, endorsed sale of the plants and said natural rubber interests throughout the world regard the present government operations as "subsidized" competition, but are willing to take their chances competing against synthetic rubber in a free market. He urged that the mortgage interest rate be increased so as not to subsidize plant buyers. Mr. Koyle also declared that "ample" supplies of natural rubber are available at reasonable prices to meet temporary rubber shortages, should they occur following transfer of the synthetic rubber plants to private ownership.

Capehart-Bricker Bill Hearings

The Senate Banking Committee opened four days of hearings on the Bricker-Capehart Bill on June 24, with the following witnesses scheduled: Edmund F. Mansure, Administrator, General Services Administration; Mr. Cravens; Ephraim Jacobs, chief, legislative and clearance section, Anti-Trust Division, Department of Justice; and representatives of Endicott Johnson, Dayton Rubber, Texas Co., U. S. Rubber, Esso, Goodyear, Sinclair, Rubber Heel & Sole Institute, Phillips Petroleum, Goodrich, Hewitt-Robins, Lee Rubber & Tire Corp., and the Departments of Defense and of Commerce.

The Shafer subcommittee heard several other witnesses, in addition to those whose testimony is summarized above. Irving Gumbel, of GSA, suggested that the job of selling the plants be given to GSA's Public Buildings administration, operating under the direction of the Treasury and Commerce secretaries and the Defense Mobilizer.

Amount of GR-S Inventory at Time of Disposal Undecided

As of late June, there was no definite decision by the government on the question of whether the RFC would be permitted to build a GR-S inventory exceeding 52,000 long tons prior to the projected disposal of the synthetic rubber plants to private industry next year. Much comment however, on the desirability of a heavier inventory was made during the course of public hearings last month on legislation authorizing disposal of the plants.

The House Armed Services committee, in its report to Congress recommending disposal legislation, said, "It is necessary for the agency now charged with operating the facilities to build up an inventory of synthetic rubber to be available for rubber consumers for a short period after the transfer period."

The report stated it would assume a two-month supply should be available after the plants are transferred, to protect consumers against any shortages which might result from temporary plant shutdowns.

But the committee urged that the inventory problem be solved by having consumers build up their own inventories, rather than have RFC hold the inventory. The committee also proposed that RFC require consumers to place firm orders for six months in advance of delivery, rather than only for a 30-day supply, as at present. The committee's thinking was that firm, advance orders for a fairly long period, such as six months, would leave RFC in a better position to schedule production operations on a steady basis. The committee's suggestion on inventory accumulation—and it is no more than a suggestion—puts it squarely up to consumers to buy a little more than current requirements from RFC so as to have an inventory on hand in their own factories or warehouses the day the rubber producing plants are sold to private industry.

The six-month period suggested for advance orders was chosen arbitrarily and derives solely from the fact that the consuming industry for some time has submitted advance projections of industrial demand for GR-S covering a six-month period. For instance, the industry, at its June 30 meeting with RFC, is expected to submit to RFC estimates covering industrial requirements for GR-S covering the period extending from July 1 to December 31, 1953. There is no reason why consumers of GR-S could not submit purchase orders providing for inventory accumulation in addition to immediate consumption requirements on the current ordering basis—getting in firm orders for a 30-day supply on the twelfth day of the preceding month.

What emerges from the Armed Services committee's report is a flat rejection of the proposal advanced by several witnesses—chiefly representatives of the large rubber manufacturing firms—that RFC accumulate an inventory of 200,000 tons of GR-S. Instead, the Committee suggests that if an inventory cushion is desirable—and it believes it is—industry, rather than the government, should foot the bill by accumulating whatever inventory it deems advisable. This plan would be accomplished by accumulating whatever inventory it deems advisable. This would be done by each customer of GR-S through his regular purchase orders placed on RFC.

Thus the committee appears to have suggested a possible way out of the present controversy over the inventory issue—a controversy which finds RFC, on one side, suggesting that it be permitted to build an inventory of 122,000 long tons of GR-S by next June, as a cushion against possible post-disposal shortages, and the Budget Bureau, on the other side, opposing—on grounds of economy—the government holding so large a rubber inventory, particularly one composed in large part of higher-cost alcohol butadiene rubber. The Budget Bureau's tentative limitation order, holding the RFC inventory to 52,000 tons, thus could remain in effect were consumers voluntarily to do as the committee suggests: assume the burden of building up their own inventory of synthetic rubber.

As of late June, RFC was still awaiting a final decision from the Budget Bureau on whether the 52,000-ton limit will stick, or whether it would be raised somewhat as RFC suggested. Budget Bureau, in turn, was awaiting the advice of ODM. Until the decision is made, RFC cannot draw up a firm production program for the year beginning July 1, 1953. In the balance is the question of how long RFC will continue to keep its alcohol butadiene plants in operation. The feedstock produced by these plants will no longer be needed by RFC, once the 52,000-ton inventory target is reached, possibly some time this autumn. If a higher inventory target is permitted, say on the size of 122,000 tons, RFC clearly will have to continue producing alcohol butadiene right up to the date the synthetic rubber facilities are transferred to private ownership.

RFC, since early this year, has been operating four alcohol butadiene units—two at Kobuta, Pa., and two at Louisville, Ky.—at a low rate of 60 tons a unit a day. This is a monthly rate per unit of 1,800 tons, or 7,200 tons for the four units combined. One Louisville unit was ordered shut down as of July 1, reducing total alcohol butadiene output to a monthly rate of 5,400 tons. The 5,400 tons of alcohol butadiene are used to produce about 6,800 long tons of GR-S. At the current rate of consumption, RFC is now adding 5,000 tons a month of GR-S to its inventory, selling about 60,000 tons a month, while producing about 65,000 tons. Unless consumption falls, the elimination of all alcohol butadiene production will mean an end to inventory accumulation for GR-S.

E. D. Kelly, director of RFC's Office of Synthetic Rubber, admitted as much when questioned by the House Armed Services committee during last month's hearings. He said that if the Budget Bureau's 52,000-ton inventory limit stands, the alcohol butadiene plants will be shut down. But he didn't say how soon.

RFC believes that even with 1,800 tons of butadiene production going down on July 1, production of GR-S can be maintained at the June level, at least for a while, because RFC has accumulated some excess supply of butadiene over the past few months, which can be run through the copolymer plants in July, and perhaps

longer. In any event the Agency plans to produce about 65,000 tons of GR-S in July, the same as the June schedule called for.

RFC also has cancelled a contract, made March 31, for 6.4 million gallons of German alcohol, which was to have been supplied by Harris & Purdy Co., Philadelphia. The reasons for the cancellation were not explained by RFC, although the cancellation came at RFC's initiative. As the situation now stands, RFC has on hand or on order enough alcohol to run the three butadiene units at the present 60-ton-a-day level through August. By that time, RFC should have a definite decision from the Budget Bureau on the GR-S inventory limit question, which will serve as a guide in planning future production operations through the balance of the fiscal year.

Here are the figures on RFC's scheduled production for June as well as actual sales during May: June production schedule: Total GR-S (rubber hydrocarbon plus oil, but excluding carbon black), 65,300 long tons; LTP, including LTP latex, 39,775 tons; black masterbatch (gross weight, rubber plus black), 10,832 tons; oil masterbatch (gross, rubber plus oil), 13,306 tons; oil-black masterbatch, none; GR-S latex, 4,310 tons; butyl, 6,700 tons. Comparable figures for May sales are: GR-S, 60,776; LTP, 37,944; black masterbatch, 10,183; oil masterbatch, 11,820; oil-black masterbatch (gross weight of rubber, plus oil, plus black), 2,100 latex, 4,214; and butyl, 8,026.

Commerce Department's New Rubber Set-Up

Secretary of Commerce Sinclair Weeks was reported last month to have under consideration a new organizational plan to bring his department into closer contact with industry and make it more responsive to industry's day-to-day needs for government services.

Keystone of the plan is the establishment of about 25 industry divisions in the Commerce Department, including a rubber division, and the establishment of new "industry councils" with broader functions than had the industry advisory committees established by National Production Authority.

As contemplated last month, the plan would be placed in effect on July 1, when NPA is slated to go out of existence.

The industry divisions would be headed in most cases by men drawn from industry, serving without compensation for a six-month period, when they would be replaced by others from industry. In some cases, instead of having industry men head divisions on a rotating basis, the divisions would be headed by career government employes. It is assumed the decision would be left to each industry. The heads of each division, under the plan, would report directly to Craig Sheaffer, Assistant Secretary for Domestic Affairs, rather than, as under NPA and earlier under Commerce, to an intermediate level of officials.

The industry councils would be composed of top officials in each industry, might have industry chairmen, would be empowered to make studies on their own initiative, to maintain their own permanent staffs, and would advise and consult with the Secretary of Commerce or his delegate on a regularly fixed schedule. The industry advisory committees to NPA, on the other hand, were composed chiefly of company vice presidents and other second-line executives, had government chairmen (the heads of industry divisions), were confined to a strict agenda drawn up by the government agency, had no staffs of their own, and met only at the call of the government, sometimes merely to "rubber stamp" some particular action the government already had decided to take.

Mr. Weeks' plan for the industry councils has been submitted to the Attorney General to make certain that the functions and operating methods it proposes for the councils conform to the anti-trust laws. Assuming that this approval is forthcoming, it may be some time before the industry councils are established and put into operation. Meanwhile it is envisioned that the industry advisory committees will be held over from NPA, although they will have little to do.

The Rubber Industry Advisory Council to NPA last month took a forward look at what functions it would like continued once NPA is abolished. Meeting with the NPA rubber division on June 3, the industry committee agreed that the industry should continue to submit both monthly and annual rubber consumption reports, at least until March 31, 1954, when the Rubber Act of 1948, as extended, is scheduled to expire. (The current synthetic plant disposal bills before Congress would extend that act until June 30, 1954.)

Discussion centered on NPA Form F-3, calling for monthly submission of data on rubber stocks, receipts, production, consumption, and shipments, and on Form F-4, requiring annual consumption reports from companies not reporting on a monthly basis. Each of these forms requires a breakdown of figures to show the amounts covered by defense orders. The advisory committee recommended that these forms be continued, but without the breakdown showing defense orders. On this point the advisory committee was in support of the position taken by the Bureau of the Budget. NPA wanted the reports continued without change until next March 31.

A majority of the committee also recommended continuation of NPA Form F-5 requiring data on types and certain size groupings of tires, tubes, and camelback, with breakdowns covering production, shipments, and inventories. The committee was evenly divided on whether to recommend continuing NPA Form F-3A, calling for data on consumption by product groups, and Form F-6, calling for weekly tire curing figures for truck, bus, off-the-road, passenger car and motorcycle, tractor and implement tires.

There were differences of opinion on the overall question of whether the industry should continue submitting statistical reports to the government. Some committee members felt that existing international tensions justify maintaining the present reporting system even at the cost of time and money to the industry because of the ever-present threat of war in Southeast Asia which could jeopardize natural rubber supplies and bring a return of consumption controls on the rubber industry here. Others felt that the industry should become independent of government guidance and control, and that detailed reports are an unnecessary burden under current conditions. It was pointed out, also, that The Rubber Manufacturers Association, Inc., collects and publishes industry data which, in many cases, parallels that reported by the industry to NPA. While quite detailed, the RMA data, according to NPA Rubber Director Walter Krappe, "supplies only part of the story" and does not provide the well-rounded statistical picture adduced from the NPA reports.

Customs Simplification Bill Introduced in the House

The House Ways and Means Committee reported to the floor with only minor changes last month the Administration supported Customs Simplification Bill. This leaves unchanged provisions of present tariff law providing use of the American selling price as the basis of valuation for imposing duties on imported rubber footwear and several other items—a special protective device first granted to the domestic rubber footwear industry in 1933.

The committee struck from the bill a proposal to increase the value of duty-free imports to $3 and, instead, retained the present ceiling of $1. Many trade groups, in hearings before the committee, protested that the increase might lead to a large-scale import mail-order business. The committee also wrote in a provision making clear that all forms of valuation would be subject to judicial review. The bill eliminates foreign value, the wholesale value of an article in the country of origin as a valuation base, and substitutes export value.

If the measure is adopted by the House, it will go to the Senate.

A spokesman for the rubber footwear manufacturing industry appeared before the House Ways and Means committee on May 27 to urge rejection of an Administration supported bill to simplify and modernize customs procedures.

The witness, C. P. McFadden, chairman of the RMA Rubber Footwear Division, said the bill will have the effect of reducing tariffs on imported rubber footwear. At the same time he expressed pleasure that the bill provides for the American selling price method of assessing duty on rubber footwear. Without this method, Mr. McFadden said, "we would have no industry."

But, he went on, "Other provisions of this bill, particularly those dealing with 'definitions,' could nullify and render meaningless this proffered protection. The bill, labeled as a Customs Simplification Bill, does not simplify, but complicates customs procedures. At least these procedures we are familiar with. The bill," he asserted, "actually is a tariff-cutting measure."

Mr. McFadden noted that the rubber footwear manufacturers and their unionized employes had testified against the Customs Simplification measure introduced in the last Congress. That bill, however, contained a provision eliminating the American selling price method for assessing duty, and it was this provision which drew the ire of the footwear industry. The provision was subsequently dropped from the bill before it passed the House last year. The bill died in the Senate committee. The new bill, now before Congress, retains the American selling price feature.

American selling price is a method by which import duties, a percentage of value, are applied on the basis of the wholesale price of a comparable article manufactured and sold in America. Only rubber footwear and a few coal-tar chemicals have this protection. On all other dutiable goods, carrying a percentage rate of duty (ad valorem), the duty is calculated on the basis of the wholesale value of the article in the country of origin. Because of lower foreign wages, this could be quite a bit lower than the wholesale price of the competitive American article and would carry a lower duty in terms of dollars and cents.

The American selling price method was extended to rubber footwear in 1933 to protect that industry against cheap competitive products from Japan and Czechoslovakia.

"The rubber footwear industry," Mr. McFadden told the committee in his appearance May 27, "is now and will continue to be vigorously opposed to any action that will deprive them of the tariff protection granted them in 1933, which saved the industry from withering on the vine."

A contrary view on American selling price had been expressed before the same committee a month earlier by Irving Jay Fain, a director of Apex Tire & Rubber Co. who had delivered a stinging attack on the entire philosophy of "protectionism" for domestic industries. Reminded by the committee that his industry has the unique protection afforded by the American selling price device, Mr. Fain replied, "I didn't ask for it, and I don't want it."

He suggested that tariff duties be eliminated gradually, only slowly enough to provide time for communities to find more efficient industries to replace those that cannot stand up against competition from those able to sell at lower prices, whether they are of domestic or foreign origin.

Mr. Fain disclosed that, rather than fearing low-cost Japanese competition, he had recently authorized a Japanese firm to manufacture Apex products and market them anywhere in the world, including the United States, under the Apex trade mark. Apex will receive a royalty in exchange for providing the Japanese manufacturer with technical "know-how" and production and marketing rights. Mr. Fain testified that if Japanese industry, by virtue of its low wage scale, could take away the American market from efficient American companies, then Japanese industrialists would not be paying out hard cash to acquire American technical "know-how." American industry, he said, has available the technology to stand up against inefficient foreign competition, regardless of relative wage scales.

Here is how the American selling price device, one of the most controversial in our customs service, works to the advantage of American manufacturers: Assume that the ad valorem duty on imported footwear is 35%. A Japanese manufacurer can market his shoes in Japan and in the United States at $2 the pair. If duty were applied on the basis of the wholesale price in country of origin, as it is with most dutiable items, his price in the United States would be $2.70 a pair. But if an American manufacturer sells a comparable shoe at $3 the pair, the 35% duty, under the American selling price system, will be applied to that $3 wholesale price, with the result that it would cost the Japanese manufacturer $3.05 (35% of $3.00—or $1.05—added to his $2 actual cost) to market in America the same shoe he sells at home for $2. The difference in this hypothetical illustration to the Japanese manufacturer is 35¢, but it more than offsets the initial price advantage otherwise enjoyed by the Japanese manufacturer.

In connection with the Fain testimony, Mr. McFadden wrote to Chairman Reed, of the House Ways and Means committee, on June 18 as follows:

"Our attention has been called to reports in the press of the appearance before your committee, during hearings on the Simpson Bill, of Mr. Irving Jay Fain, director of the Apex Tire & Rubber Co., Pawtucket, Rhode Island, who vigorously urged the elimination of all tariffs. These newspaper reports gave the impression that Mr. Fain was speaking as a manufacturer of rubber footwear.

"Since Mr. Fain's position was directly contrary to that presented to you as the position of members of our Footwear Division, we are concerned that a misunderstanding may exist among your members. We also are fearful that, unless the record is corrected, we possibly may be embarrassed if we participate in any future discussions on foreign trade matters.

"I called on Mr. Fain at his offices in Pawtucket a few days ago and explained the situation to him. He assured me that he did not intend to give the impression to your Committee that he was a manufacturer of rubber footwear. He authorized me further to inform your Committee that: (1) Apex Tire & Rubber Co. does not manufacture either waterproof rubber footwear or rubber-soled canvas footwear. (2) Mr. Fain has no connection whatsoever with the manufacture of such products. (3) The technical assistance agreement between Mr. Fain and his associates and Japanese interests has nothing whatsoever to do with rubber footwear.

"It is probable that the confusion over Mr. Fain's testimony arose from his reference to one of his company's products—shoe soling. This product is used on leather shoes, but is not used in waterproof rubber footwear or rubber-soled canvas footwear. Incidentally, there is some reference to rubber tires in the transcript of Mr. Fain's testimony under questioning. Mr. Fain told me his company does not make rubber tires.

"This letter is written to you in the hope that it will clarify the record, although we are aware that your Committee has reported the Reciprocal Trade Bill to Congress. Our industry does not want an unfortunate misunderstanding to remain unexplained which might possibly arise to prejudice us in some future appearance before your Committee or its successors."

Government Tire Testing Program Condemned

The House Armed Services subcommittee on Defense Activities, headed by Rep. William E. Hess, of Ohio, issued a report on May 28 condemning the government's tire testing program at Camp Bullis, Tex., as "a wanton waste and a profligacy which brings down upon government the just scorn and condemnation of the taxpayer."

The subcommittee recommended that the Army Ordnance Corps be directed by Congress to withdraw from the program and that the House Appropriations committee immediately withdraw all funds for the program, conducted by RFC, with Army participation. In the fiscal year just ended, $1,950,000 was spent for the program, with the Army contributing $486,000. The government is seeking an appropriation for the fiscal year beginning July 1, 1953, of $2,140,000, with the Army contributing $600,000. The tire testing is conducted by Copolymer Corp. under a contract with RFC on a cost-plus-percentage basis, the Hess report stated.

The specific charges made by this report have received no official comment, although it is understood that both RFC and Army Ordnance believe many of the charges are false, and Ordnance has prepared a lengthy and detailed rebuttal statement which it has not, at this writing, released. Apparently neither agency wants to pick an open fight with Congress while their appropriations are still under consideration.

These are the chief charges made in the Hess report: (1) Military vehicles are tested 3,000 miles away from Camp Bullis, where the tires designed for use on these vehicles are tested. (2) Tire manufacturers put their construction industry type of tires through rigorous testing procedures, and their testing facilities should be used for military tires, thus eliminating the "duplication" of the Bullis program, at savings to the government. (3) The reason why testing was initiated at Bullis was to show the way toward expanded use of synthetic rubber in tires, with the aim of eliminating dependence on natural rubber. Given the present status of industry knowledge on the adaptability of synthetics, such experiments no longer are necessary.

The rebuttal of government experts to these charges is: (1) Vehicles are tested at Bullis (as well as elsewhere), but the only cross-country tests are conducted at Bullis. (2) Construction-type tires are tested in light of predictable usage conditions; while military tires must be tested for a variety of conditions and at higher speeds. (3) The job of adapting synthetic rubber for tires will not be complete until a satisfactory heavy-duty truck tire can be made entirely of synthetic, and this is yet to be achieved. As for the broad charge that too many men (284) are employed in the Bullis program, compared to the high of 99 by any private firm, the Army replies that it tests a greater number and variety of tires, and the 284 include clerks assigned to the Bullis project.

Senate Restores Fund for Census of Manufactures

The Senate last month voted to restore funds previously denied by the lower House to conduct the Censuses of Business, Transportation, Manufactures, and Mineral Industries in the coming year. The Senate approved $9.4 million to be spent by the Census Bureau on this project, adding a proviso that the fund must be used up by December 31, 1956, when the four censuses —a gold mine of information on and for business—are to be completed, under present plans.

Previously the House, in acting on the Commerce Department appropriation bill for fiscal 1954 (Census Bureau is part of Commerce) denied any funds for the four censuses. This action aroused strong protests from business interests, who, led by the Business Advisory Council to the Commerce Department, urged the Senate Appropriations Committee to restore the $11.5 million sought by the Eisenhower Administration.

The appropriation bill, at this writing, is headed toward conference between the House and the Senate Appropriations committees. If the House conferees fail to agree to funds for the censuses, there is still a possibility that the Administration may seek a deficiency appropriation for the censuses early next year. As reported last month, rumor had it that Commerce Secretary Weeks had been assured of favorable action on such a request if Congress failed to provide sufficient funds this year.

Other National News

Humphreys Predicts New Record in 1953

H. E. Humphreys, president, U. S. Rubber, predicted on June 23 that the rubber fabricating industry would set a new record during the first six months of 1953 by converting 730,000 tons of new rubber into finished products. He added that rubber consumption for the entire year probably would reach 1,400,000 tons, 11% more than in 1952, the record year to date.

"We now expect the industry to turn out 96,000,000 passenger-car and truck tires before the year-end," he continued. "If we add airplane, farm, and industrial tires, we get a total of 102,000,000, which is 7½% more than in 1952 and surpasses by 1,000,000 the all-time record set in 1947."

The uptrend in the use of liquid latex is continuing this year, largely because of the expansion of foam rubber production for mattresses, furniture and automobile cushioning, Humphreys said. He estimated that consumption of latex would amount to 120,000 tons, dry weight, this year, against 105,000 last year and 42,000 in 1946.

URWA Starts Wage Talks

Company-wide wage negotiations between the United Rubber Workers of America and Goodyear, Firestone, and Goodrich began in June. The union indicated it would ask for a "substantial" pay increase for its members, improved pension and insurance benefits, and correction of plant and area wage inequities.

Under the terms of the working agreements with the three mentioned companies, the union can open the wage question for negotiations at any time, on 30-day notice.

No wage negotiating session with U. S. Rubber has been scheduled, but it is understood that wage negotiations with General Tire will start in July.

The 1952 wage increase in the industry amounted to 10¢ an hour.

Newman Retires at Goodrich

Retirement of James J. Newman, vice president of The B. F. Goodrich Co., Akron, O., on July 1, was announced June 1 with "sincere regret" by John L. Collyer, president.

Mr. Newman, who decided last year to elect early retirement, joined Goodrich in 1931 as assistant to the president. He was elected a vice president two years later and has played an important role in all phases of the company's operations and in addition has served on many industry and government committees. During World War II and the Korean war, while government controls were in effect, Mr. Newman was a leading figure in representing the rubber industry to government.

Mr. Newman is a member and a former chairman of the Inter-Industry Highway Safety Committee; a director of The Rubber Manufacturers Association, Inc.; and a trustee of the Automotive Safety Foundation and a member of its operating committee. In 1951 he served as an industry adviser to the U. S. State Department in meetings of the International Rubber Study Group at Rome, Italy, and in 1936 represented the rubber manufacturing industry of the United States at a meeting of the International Rubber Regulation Group in London.

New Major Divisions Formed

Organization of two major divisions of the Goodrich company, integrating sales, manufacturing, and necessary staff functions, was announced last month by John L. Collyer, president.

Arthur Kelly, a vice president of the Goodrich company, has been named president of The B. F. Goodrich Co. Tire & Equipment Division.

Clyde O. DeLong has been made president of the new B. F. Goodrich Co. Industrial Products Division. DeLong formerly was general sales manager of the company's industrial products division.

Named by Kelly as vice presidents of the new tire and equipment division are Joseph A. Hoban, general manager of tire merchandising, who becomes vice president-replacement sales; E. F. Tomlinson, former general manager of the automotive, aviation and government sales division, and now vice president-equipment sales; and J. E. Gulick, general manager of tire manufacturing, who becomes vice president-manufacturing.

As vice presidents of the new industrial products division, DeLong named Robert V. Yohe, president of American Anode, who becomes vice president-sales; and Rollin D. Hager, general superintendent of the company's industrial products manufacturing in Akron, who becomes vice president-manufacturing.

Commenting on the establishment of the newly formed divisions, President Collyer said, "The continuing diversification and growth of the company's business, both presently and in the future, indicate the announced form of decentralized responsibility for operation to be in the best interests of the company, its customers, employes and stockholders."

Millionth Tire for Holland Associate

Production of the millionth tire of N. V. Nederlandsch-Amerikaansche Autobandenfabrick "Vredestein," an associate company of B. F. Goodrich, was witnessed by John L. Collyer, president of the parent company. Mr. Collyer visited the plant while in Europe to attend the recent meeting of the Rubber Study Group in Copenhagen, Denmark.

Basic Materials Conference and Exposition

The first Basic Materials Conference and the first Exposition of Basic Materials for Industry were held concurrently on June 15-19 at the Hotel Roosevelt and Grand Central Palace, respectively, in New York, N. Y. A group of 25 experts addressed the conference on materials being used today and those expected to be used in quantity in the future. General chairman of the conference was T. C. DuMond, editor of *Materials & Methods*.

Of special interest were the addresses by J. J. Harwood, Office of Naval Research; N. E. Wahl, Cornell Aeronautical Laboratory, Inc.; and H. M. Quackenbos, Bakelite Co. Mr. Harwood said that reinforced plastics are supplementing metals in many fields as well as creating new fields of their own. He expressed the belief that high-speed aircraft of the future may depend more upon these plastics than on metal.

Mr. Wahl discussed the "Application of Sandwich Construction to the Design and Fabrication of Helicopter Blades." The blades are made of a balsa wood core wrapped with plies of Fiberglas brushed in place with resin; the envelope cloths are then applied, and the unit is placed into a mold for curing the laminate by heat (approximately 120° F.) and pressure (70 psi.).

Mr. Quackenbos discussed briefly the properties of molded and extruded plastics and recommended that the emphasis of any new manufacturer in this field be placed on extensive field testing and careful engineering of the designs.

The Exposition consisted of displays of the basic materials of industry and some of their applications. Among the companies represented at the exhibit were American Hard Rubber Co., which showed a variety of hard rubber, rubber-resin blends, and thermoplastic materials including three new materials; Tempron (based on nitrile rubber), Ace-Riviclor (unplasticized rigid PVC), and Dur-Ace (a multi-polymer thermoplastic). Other displays and their main features included those of Richardson Co., Formica Co., and Synthane Corp., with laminated plastics; Bakelite, E. I. du Pont de Nemours & Co., Dow Corning Corp., Firestone Plastics Co., M. W. Kellogg Co., and Rohm & Haas Co., showing their respective resins; Auburn Mfg. Co., gaskets and packings; Continental-Diamond Fibre Co., Teflon and Fiberglas products; Haveg Corp., corrosion resistant equipment; National Vulcanized Fibre Co., phenolic laminates and melamines; Owens-Corning Fiberglas Corp., reinforced plastics; Plymouth Industrial Products, Inc., thermoplastics; Polymer Corp., nylon and Teflon applications; Sponge Rubber Products Co., cellular rubber and expanded PVC; Brown Co., plastics extenders; Mica Insulator Co., laminates and silicone coatings; Mt. Vernon-Woodberry Mills, Inc., synthetic fibers; and Polyplastex United, Inc., plastic impregnation process. Among other exhibitors were Carborundum Co., Norton Co., South Florida Test Service, and United States Testing Co.

Du Pont on European Industry

Pierre S. du Pont, 3rd, rubber chemicals division, E. I. du Pont de Nemours & Co., Inc., recently returned from a four-week visit through the major industrial centers of Europe with a report that optimism is the outlook of the Continental rubber industry. Stepped up production in all lines of rubber goods is planned to facilitate long-range programs of expansion and modernization.

Mr. du Pont foresees a broadening demand for American rubber in Europe, particularly the special-purpose types, although he declared that "their technology lags behind ours and many plants are anything but up-to-date or well-equipped."

The purpose of Mr. du Pont's visit was to deliver addresses at conferences of rubber manufacturers and technical personnel in London, Paris, Milan, and Cologne. He spoke on the development, properties, and applications of neoprene.

Plans Acrylonitrile Plant

B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, O., has announced plans to build an $8,500,000 plant in Calvert City, Ky., for the production of acrylonitrile. The new facility will be adjacent to the company's recently opened vinyl chloride monomer plant in Calvert City and will receive its principal raw material, acetylene, by pipeline from the nearby plant of the Air Reduction Co. Operation of the plant is expected to begin in the Fall of 1954, with an annual capacity of 24,000,000 pounds.

Libbey-Owens-Ford Glass Co., Plaskon Division, Toledo, O., has established a special representative on plastics to the automotive industry. This specialist, E. Davis Caldwell, will have his office in Detroit and will be responsible for the use by auto manufacturers of the company's alkyd, melamine, and urea molding compounds, and glass-fiber reinforced plastics.

Foxboro in Mexico

Announcing the organization of a Mexican affiliate, Graficas e Instrumentos, S. A., The Foxboro Co., Foxboro, Mass., strengthens its international service to users of industrial instruments for measurement and control. A key link in Foxboro's worldwide network, the new firm, in Mexico D.F., has been incorporated for the future manufacture and assembly of instruments and instrument supplies. Its engineers, graduates of Foxboro's extensive training courses, are well qualified for their duties and will handle all types of repair work, from simple adjustments to major overhaul.

The new concern has obtained factory facilities adjacent to Schultz y Cia., Foxboro's sales representatives in Mexico, establishing close cooperation between the two companies and insuring quick, convenient service for instrument users in Mexico. Already in full production is the chart department, printing Foxboro precision charts for all types of recording instruments.

The Mexican company is the third to join the list of Foxboro's international affiliates. Companies in London and Montreal, for more than 20 years, have manufactured virtually the entire line of Foxboro instruments, helping to supply the many engineering firms who represent Foxboro throughout the world.

Jeffries with Valve Firm

Lloyd W. Jeffries is now general sales manager of both Valvair Corp. and its affiliate, The Sinclair-Collins Valve Co., both at 454 Morgan Ave., Akron, O. Mr. Jeffries has had many years' experience in the air valve field, embracing management, merchandising, and production.

He succeeds Kenneth E. Knotts, who becomes sales representative for Valvair in metropolitan New York and northern New Jersey. The K. E. Knotts Co.'s headquarters are at 106 Miln St., Cranford 6, N. J.

Propionic, Butyric Acids

The large-scale production of propionic and butyric acid at the newly constructed special products unit of the Pampa, Tex., plant of Celanese Corp. of America, New York, N. Y., has been announced. These products, used in the manufacture of cellulose plastics, are reportedly produced by a new process involving the one-step oxidation of natural gas components to acetic, propionic, and butyric acids.

Keach Joins Pioneer Rubber

J. R. Keach has joined Pioneer Rubber Mills as assistant to the executive vice president. Previously Mr. Keach had been vice president and general manager of Quaker Rubber Co., Philadelphia, and before that position, had been general plant manager of the Firestone Tire & Rubber Co.'s five industrial division plants. His industrial rubber experience dates back to 1926.

In addition to the industrial rubber products made at the Pioneer factory at Pittsburg, Calif., a subsidiary, Extruders, Inc., Los Angeles, manufactures a wide range of plastic goods such as garden hose, film, tubing, insulation, packaging materials, etc.

George F. Halfacre Philip M. Ginder

Promotions at New Jersey Zinc

Philip M. Ginder has been elected a vice president, and George F. Halfacre has been appointed manager of manufacturing of The New Jersey Zinc Co., 160 Front St., New York 38, N. Y.

Mr. Ginder is also vice president of The New Jersey Zinc Co. (of Pa.), having progressed through that organization from the position of chemist, which he assumed at the time of his employment in 1911. He has been chief of the slab zinc department and superintendent and general superintendent of that company's smelting plant at Palmerton, Pa.

Mr. Halfacre likewise started with the company as a chemist and has been in its employ since 1918. He has held successively the positions of assistant chief and chief of the slab zinc department, superintendent of the West Plant, and assistant general superintendent and general superintendent of the Palmerton Plant.

Hewitt Shuttle Conveyor

A new shuttle conveyor, designed for use in continuous mining and quarry operations, has been developed by Hewitt-Robins, Inc., Stamford, Conn. Extendable to 600 or 700 feet by a rope haul, the conveyor can follow the progress of mining while maintaining a fixed discharge or transfer point. It may receive material directly from the mining machine or from an intermediate unit such as a shuttle car, conveyor, or loading machine.

The conveyor has a minimum belt width of 24 inches, a maximum capacity of 250 tons an hour, and is manufactured in lengths up to about 500-foot centers and in intermediate sections of eight feet each. These intermediate sections are equipped with rubber-tired, anti-friction bearing wheels and a covered deck to protect the return portion of the belt. Mechanisms at the fixed discharge point drive the conveyor, move it forward or backward, and tension the belt.

New Carbon Black Plant

Continental Blacks, Inc., will build a plant at Ponca City, Okla., designed to manufacture 40,000,000 pounds annually of high abrasion furnace black. Construction of the facility, which will receive its raw material from Continental Oil Co.'s refinery at Ponca City, will start immediately and is expected to be completed early in 1954. The output of the plant will be marketed by Witco Chemical Co., 260 Madison Ave., New York 16, N. Y.

To Make Armament Equipment

Stillman Rubber Co., Culver City, Calif., designer and producer of molded rubber products for aircraft and industrial use, and John F. Drescher, an aircraft armament engineer, have joined resources to form Microloc, a new venture for research, design, and development of electro-mechanical specialties and armament equipment for use in aircraft and guided missiles.

Mr. Drescher has been appointed chief engineer, and Walter Fleming, general manager of the new concern.

Stillman officials and Mr. Drescher said the new venture was fully staffed and has been working on a number of projects of a secret nature whose details could not be disclosed.

Said Harold Sears, Stillman president, and Mr. Drescher in a joint statement: "The creation of Microloc will diversify our activities and place us squarely in the midst of a most responsible problem—development of devices that will help make our airplanes and missiles more deadly—and keep America strong in the air."

Mr. Drescher has achieved a fine record in the design and development of aircraft armament devices, including bombing and rocket interval controls, electric bomb racks and shackles, guided missile components, and machine gun chargers and rounds counters.

Stillman has won recognition for its rapid growth and contributions in the field of rubber-forming technology.

Witco Rebuilds

A 25,000-square foot warehouse was recently completed at the Chicago plant of Witco Chemical Co. to replace the 20,000-square foot warehouse burned down in June, 1952. Built at a cost of $150,000, the new unit is equipped with a sprinkler system to guard against a recurrence of last year's fire.

In addition, a new office building adjacent to the warehouse has been erected to house the executive and administrational departments of the plant.

Velon Upholstery Material

Firestone Plastics Co., Pottstown, Pa., has introduced a group of three new printed patterns in Velon vinyl plastic upholstery material. Designed specially for dinette furniture by Walter M. Litter, the patterns of Tanglewood, Ferndale, and Nebula are embossed on 12-gage material in either glossy or taffeta-textured finish.

Matching table tops in each of the new patterns are being produced by Decar Plastic Corp., Middletown, Wis., thus permitting the customer a complete package of both chair upholstery and laminated table tops.

New Upholstery Fabric

Bolta-Saran, Inc., Lawrence, Mass., has introduced a new upholstery fabric woven entirely of saran plastic fibers. Known as Spun Boltaflex, the material is claimed to be durable and stainproof while having the appearance and feel of wool. In addition, the fabric is said to "breathe" and to be capable of washing, self-extinguishable, and impervious to moisture. It will be marketed in two patterns of seven colors each.

Phenol, Acetone Plant Dedicated

A new plant for the manufacture of phenol and acetone was formally dedicated on May 27 by Hercules Powder Co., Wilmington, Del. Located in Montreal East, P.Q., the new plant will be operated by B. A. Shawinigan, Ltd., under license from Hercules and The Distillers Co., Ltd., of England. Peak production expected from the unit is given at 13,000,000 pounds of phenol and 8,000,000 pounds of acetone per year.

The facilities are reported to be the first to produce these materials by a process involving the formation of cumene from benzene and propylene, the oxidation of cumene to the hydroperoxide, and the catalytic splitting of cumene hydroperoxide by air oxidation into phenol and acetone. This same oxidation-cleavage principle is being successfully used by Hercules for the production of related phenolic compounds such as paracresol, resorscinol, etc., and will again be employed in a new $8,000,000 plant being constructed by the company near Gibbstown, N. J., for the production of phenol and acetone for consumers in the United States.

Advantages claimed for the process include lower capital investment, lower processing costs, and simpler waste disposal problems, plus the production of salable by-products of acetophone, alpha-methylstyrene, and mesityl oxide.

Pike with Giffels & Vallet

Edwin Frederic Pike, of New York, has been appointed director of the chemical engineering department, Giffels & Vallet, Inc., L. Rossetti, associated engineers and architects, Detroit, Mich. Dr. Pike takes over his new position following completion of a survey on the chemical potentials of Ireland for the government of that country. His business experience during the past 27 years has been marked by executive positions and consultation services for Wallace Clark & Co., Smidas Co., American Home Products Corp., Gelatin Products Corp., Armour & Co., A. E. Staley Mfg. Co., and Kieckhefer Container Co.

Under Dr. Pike's direction will be the chemical engineering activities for Giffels & Vallet, Inc., L. Rossetti offices in Detroit, New York, Chicago, Houston, and Windsor.

The company plans increased activity in the chemical and chemical process design fields, according to President Victor E. Vallet, to meet the needs of the nation's fastest growing industry. Currently the company has in the design stage many projects for five major chemical firms.

Skelton Opens Akron Office

S. S. Skelton Co., 2775 S. Moreland Blvd., Cleveland 20, O., has opened an Akron office at 68 E. Mill St. This office will be under the management of T. E. Cook, who has been associated with the rubber industry for the last nine years, formerly with The Firestone Tire & Rubber Co., Synthetic Rubber Division, operated by Reconstruction Finance Corp., as purchasing agent and later as the chemical buyer for the parent company. Mr. Cook's sales responsibilities will include the major rubber companies in Akron as well as the chemical and rubber trade in the central and western part of Ohio.

Victor T. Norton

Norton Succeeds Hendrickson

Victor T. Norton has been elected president of American Hard Rubber Co., 93 Worth St., New York 13, N. Y., succeeding Frank D. Hendrickson, retired. Mr. Norton, formerly administrative vice president of the National Broadcasting Co., has held top executive positions with several nationally known companies.

Mr. Hendrickson retires after 30 years' active service with the company, of which he was president for the past 11 years. While he continues as a director and as a consultant to the company on a part-time basis, his major interest will be in his farm in Kilmarnock, Va.

Adds to Facilities

More extensive, centralized storage-and-handling facilities to serve Diamond Alkali Co. customers in New Jersey, New York, and surrounding areas have been completed and are now in operation at the company's Jersey City silicate plant.

In line with Diamond Alkali's continuing policy of increasing customer service, the new construction provides 24,000 additional square feet of storage space for packaged chemicals. It consists of a steel frame-transite siding structure 200 feet long by 120 feet wide. A masonry wing, 21 by 52 feet, attached to the east end, houses the employes' locker room, lunch room, service quarters, and office.

W. H. Evans, general manager of silicate operations at the company's Cleveland headquarters, described the expansion as part of a company-wide program to insure faster and better service to all consumers of Diamond Alkali chemicals. He added that a similar project recently was completed at the company's Cincinnati (O.) silicate plant.

Edward J. Fox, recently associated with John W. Stokes & Co., has been appointed to the staff of National Association of Waste Material Dealers, Inc., 271 Madison Ave., New York 16, N. Y., as assistant to George W. Reid, treasurer, and manager of the credit, adjustment, and collection bureaus of NAWMD. Mr. Fox also formerly held positions in sales and banking and insurance.

Wyandotte Research Facilities

The new research center of Wyandotte Chemical Corp., Wyandotte, Mich., went into full operation early last month, dedicated to providing more and better chemical products to industry and to the public. The new laboratories now make possible consolidation of research and development activities of the company plus expansion of long-range organic and inorganic research.

The center is composed of a pilot plant, a high-pressure laboratory, and the newly opened research laboratory. This latter unit consists of a two-story brick structure of 76,000 square feet of floor area. Special areas within the facility are devoted to the investigation of radioactive tracers, nucleonics, electronics, organic and inorganic chemistry, sanitation and germicides, electroplating, physics, etc.

A rubber laboratory is contained within the inorganic research department. It is equipped with two-roll rubber mills, a Banbury mixer, curing presses, vulcanization equipment, a rubber extruder, a plastics extruder, etc., for applications involving the company's precipitated calcium carbonates, which are used as reinforcing and extender pigments by the rubber industry.

Promoted by 3M

Promotion of three members of its central research department was announced June 1 by Minnesota Mining & Mfg. Co., St. Paul, Minn.

Matthew W. Miller was made business manager, and Alvin M. Borders and Harold M. Scholberg, associate directors of the central research department.

Dr. Miller joined 3M as a research chemist in 1947 and most recently was an assistant director of the department.

Dr. Scholberg, who will head the physics, inorganic chemistry, and physical chemistry sections of central research, started with the company as a senior chemist in 1944, and was made leader of the electrochemical section in 1948 and assistant director of central research in 1951.

Dr. Borders for ten years was engaged in synthetic rubber research with the Goodyear Tire & Rubber Co. He then did research work with the Institute of Paper Chemistry from 1948 until 1950, when he joined 3M. He became a section leader of the central research department in 1951.

New G-E Warehouse

Increased demand for silicone products by Midwest industries has led to the establishment of a warehouse in Chicago, Ill., for rapid delivery of the new chemical materials produced by General Electric Co.'s silicone products department at Waterford, N. Y. At 427 W. Erie Blvd., this warehouse is stocking G-E silicone rubber gums and compounds, fluids for waxes and polishes, resins, electrical insulation, emulsions for mold release purposes, and a variety of other silicone materials.

The new facilities are described as a G-E service to Midwest rubber fabricators, electrical manufacturers, wax and polish companies, and other concerns who require rapid deliveries of silicones.

The company has similar warehouses at Anaheim, Calif., Cleveland, O., and Waterford. The service in Chicago will be under the supervision of the G-E silicone sales offices at 840 S. Canal St.

New Bakelite Executives

George C. Miller has been appointed president of Bakelite Co., a division of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y. Mr. Miller replaces H. S. Bunn, vice president of Union Carbide, who now succeeds the late J. W. McLaughlin as chairman of Bakelite and as a member of the appropriations committee of Union Carbide. Mr. Miller entered the employ of Linde Air Products Co., another division of Union Carbide, in 1922. After several years as a field engineer, and subsequently a construction engineer for Carbide & Carbon Chemicals Co., he was transferred to this company's early development work on plastics. In 1934, Mr. Miller became a technical sales representative for the plastics department of Carbide & Carbon, rising progressively to sales manager of this department, general sales manager, thermoplastics department of Bakelite in 1944; vice president and general sales manager of Bakelite in 1945; and vice president in charge of sales in June, 1952. He is a member of the Society of the Plastics Industry, Society of Automotive Engineers, and Chemists Club of New York.

C. W. Blount has been appointed vice president in charge of sales, and H. K. Intemann vice president and general sales manager for Bakelite. Mr. Blount succeeds Mr. Miller, while Mr. Intemann succeeds Mr. Blount. The latter joined the company in 1924, and Mr. Intemann, in 1930.

AIEE and Anaconda

Members of Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y., recently addressed sessions in a course on "Cables" which was sponsored by the educational committee of the New York Section, American Institute of Electrical Engineers. The speakers included A. A. Jones, who discussed conductors, and Edward Eich, who delivered an address on "calculations." Besides attending the lectures, held at Westinghouse Auditorium, New York, N. Y., a group of 63 course members was conducted on a tour of the manufacturing and research areas of the company's Hastings plant.

Packaging Carbon Black

The development of a machine, the Rollpac, for packaging carbon blacks has been announced by United Carbon Co., Inc., Charlestown, W. Va. This machine features a bag press, which is claimed to flatten the package so that a saving in storage and shipping space of approximately 20% is possible. All carbon black manufacturers may use the device, on which patent application is pending, without charge.

Harris-Holmden Co. Formed

The merger of Tedd Harris Co. with Tonawanda Welding Service into the Harris-Holmden Co., has been announced. The new company occupies 7½ acres of land in North Tonawanda, N. Y., and manufactures quick-opening and closing safety doors for pressure vessels, Scotch marine package boilers, filters, and heat exchangers. Products of the new firm will henceforth carry the trade name Tharco.

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John Andrews

Cabot Sends J. Andrews to England, G. Cash to Canada

Cabot Carbon, Ltd., British subsidiary of Godfrey L. Cabot, Inc., Boston, Mass., chemical manufacturing firm, has appointed John Andrews managing director at its Ellesmere Port Plant, near Liverpool.

Mr. Andrews replaces George H. Cash, who left England for Sarnia, Ont., Canada, where he will assume new duties as vice president and general manager of Cabot Carbon of Canada, Ltd.

Mr. Andrews, a member of the Cabot U. S. organization since 1945, has had wide experience at company plants and laboratories in the fields of carbon black and other Cabot product manufacture. Much of his time has been spent in the sale of carbon black to the rubber, ink, and allied industries and in the development, growth, and sale of a wide range of plasticizers for use in the rubber and the plastics industries.

Mr. Andrews joined Cabot after five years with the United States Army Air Force. Early in his Cabot career he was assigned to the sales department where he concentrated particularly on sales of carbon blacks and plasticizers. Later he was in charge of carbon black sales to rubber manufacturers in New England and also headed the newly formed plasticizer division, which has been expanded considerably during the past two years.

An active member of the Division of Rubber Chemistry, A. C. S., he was chairman of the Boston Rubber Group in 1952.

Annual Kleinert Luncheon

The annual Infant's Wear luncheon of I. B. Kleinert Rubber Co., New York, N. Y., was held June 3 at the Hotel Astor, New York. The audience, which consisted of more than 1,000 buyers and merchandise managers, heard speeches by Lawrence B. Sizer, vice president of Marshall Field & Co.; Lester Gaba, display expert; Ralph K. Guinzburg, president of Kleinert's; and Richard Bleier, director and assistant to the president at Kleinert.

The talks emphasized modernization of display techniques, including the use of self-selectors, as a means of increasing infants' wear sales. A skit by Faye Emerson and Ben Grauer dramatized past and present selling practices in infants' wear departments.

Rubber Road Survey

Natural Rubber Bureau recently completed a nation-wide survey of highway officials and engineers to determine their opinion of rubber roads. Answers which were received from one out of every 15 such eligible persons throughout 47 states indicate that one-half of the officials could find no disadvantage with rubber roads, and one-third believed that the use of rubber will become standard in road construction within the coming years.

The major reservation found was that of added cost due to the addition of 1½-5% rubber powder to the mix. It is contended, however, that the additional initial cost will be more than repaid by the added longevity and reduced repair cost of the highways. Already tests have indicated that less bleeding in summer, less cracking in winter, and better resistance to traffic shocks can be expected from rubber roads. It is expected that more definitive answers concerning the savings to be gained from the use of rubber will be available next year, the fifth year since the laying of the first asphalt-rubber road mix.

This survey, "What Do American Highway Officials Think of Rubber Roads?", was conducted by the market research division, Channing L. Bete Co., Inc. The results are compiled into a 34-page booklet available from the Natural Rubber Bureau, 1631 K St., N.W., Washington 6, D. C.

Stops Production of Casein

Hercules Powder Co., Wilmington, Del., has announced its intention to cease production and sale of acid and rennet casein on August 1. The reason given for this action is that domestic milk prices have made it economically impossible to manufacture casein at costs which permit sale in competition with imported casein. Sales, technical service, and production will continue until August 1, at which time the company's plants in Elroy, Wis., and in Cambridge and Watertown, Minn., will be closed.

Research Contract

The Office of the Quartermaster General, United States Army, has let a contract to the College of Forestry, State University of New York, Syracuse, N. Y., for the purpose of studying the rates of gas transmission through flexible packaging materials. The work will involve a basic analysis of the movement of different types of gases, under various conditions, into and through many types of polymeric and cellulosic film.

Shaped Bag for Carbon Black

A new shaped valve-type bag of 50-pound capacity for carbon blacks which is claimed to cut storage and shipping space requirements by 25% has been introduced by J. M. Huber Corp., 100 Park Ave., New York 17, N. Y. The bag is passed through a deairing process which removes excess air and results in a less voluminous package. This reportedly permits the construction of compact unit loads that hold up better in transit and are easier to unload and store than the conventional open-mouth bag or the previous valve-type units of J. M. Huber.

Noonan Succeeds Norton; Others Advanced at U. S. Rubber

Chester J. Noonan was appointed, effective July 1, vice president and general manager of the footwear and general products division, United States Rubber Co., Rockefeller Center, New York 20, N. Y. He succeeds Walter H. Norton, who retired June 30.

Eugene A. Luxenberger, assistant production manager, replaces Mr. Noonan as assistant general manager of the division, whose products include waterproof and fabric footwear, waterproof clothing, foam rubber cushioning and mattresses, elastic yarns, coated fabrics, sponge rubber rug underlays, golf balls, water wear, plastic products, and aircraft fuel cells.

Mr. Noonan started with the company in 1919 as a clerk in Great Falls, Mont., and became footwear sales manager in Salt Lake City in 1922, and in Los Angeles in 1929; Pacific Coast sales manager in 1933; manager of clothing and coated fabric sales in 1938; general sales manager in 1943; and assistant general manager of the division in 1950.

Mr. Luxenberger started with the company as a production worker at the plant in Williamsport, 32 years ago, and was transferred to the Mishawaka, Ind., plant as manager of industrial engineering in 1932. Successive promotions brought him appointment as factory manager in 1943. Since 1951 he has served as assistant production manager, responsible for manufacturing activities in the division's plants in Mishawaka and Washington, Ind., Milan, Tenn., Chicago, Ill., and Stoughton, Wis.

Mr. Norton has been with U. S. Rubber nearly 42 years, when he started as a stock clerk in Boston. In 1915 he joined the cost department of the company's Naugatuck, Conn., footwear plant. Following a series of positions in production supervision, he became production superintendent of the plant in 1919. He was appointed factory manager of the Williamsport plant in 1921 and of the Naugatuck footwear plant in 1928. In 1941 he became production manager of the footwear division and in 1943, assistant general manager. He has been vice president and general manager since 1950.

Pach Bros., N. Y.

Chester J. Noonan

Executives Promoted in Textile Division

Major changes in management assignments in the textile division of United States Rubber Co., and the addition of two new branch offices in Philadelphia and Atlanta were announced June 1 by W. D. Johnson, merchandise manager of the division. The changes are being made to meet the demands of expanded activities, Mr. Johnson said.

W. O. Jelleme, assistant merchandise manager of the division, has been placed in charge of market research for the company's present and planned industrial fabrics. Mr. Jelleme will continue his supervisory responsibilities for economic analysis, in which he will be assisted by Charles G. Anderson.

R. A. All, in charge of industrial relations and labor standards for the division for the past eight years, will become assistant to the merchandise manager. Mr. All joined U. S. Rubber in 1937 at the Hogansville, Ga., plant and was transferred to Winnsboro, S. C., in 1938 and to the general offices in New York in 1944.

J. A. Arrouet, fabric development engineer, will now be responsible for basic fabric and product development. He has been in the textile field since 1929 and joined U. S. Rubber earlier this year.

Joseph F. Hartman has been appointed consumer fabrics sales representative for the Philadelphia and Baltimore areas, with headquarters in the textile division's new office at the U. S. Rubber branch in Philadelphia. Mr. Hartman, affiliated with the textile business for 13 years, recently joined the rubber company and will handle the sale of U. S. Royal fabrics in eastern Pennsylvania, southern New Jersey, Delaware, and Maryland.

C. F. Cline, Jr., will be consumer fabrics sales representative for the southeastern states, with headquarters at the company's branch in Atlanta. Mr. Cline has been with U. S. Rubber for 17 years, with positions at company plants in Winnsboro, S. C., Shelbyville, Tenn., Passaic, N. J., and New Bedford, Mass. Recently he was textile specialty sales representative for the company's mechanical goods division, working out of Atlanta. Mr. Cline will handle consumer fabrics sales in North Carolina, South Carolina, Georgia, Alabama, and Florida.

J. E. Sullivan has been named manager of industrial relations and labor standards for the textile division; while W. Lindsay Wylie has been made his assistant, and A. G. Quattlebaum has been appointed to the new position of office manager for the production management section of the division. After August 1 all three men will have their headquarters in the production management section of the division, which is being moved from the company's New York office to Winnsboro.

Mr. Sullivan, who succeeds R. A. All, since November, 1951, has been assistant manager of labor standards for the division. He joined the company in 1939 and in 1945 was made standards supervisor of Winnsboro Mills.

Mr. Wylie replaces Mr. Menti and has been with the company since June, 1951, in the engineering and production departments at Winnsboro Mills.

Mr. Quattlebaum in 1934 started at Winnsboro Mills; was transferred to Shelbyville Mills as chief accountant in 1941; and was office manager of Seaboard Mills at Burlington, N. C., from 1947 to 1952. When Seaboard's operations were consolidated with those at Winnsboro Mills, Mr. Quattlebaum was appointed assistant office manager at Winnsboro.

Ronald R. Menti has been appointed assistant to H. Gordon Smith, executive vice president of the rubber company. Mr. Menti was formerly supervisor of employe relations for the textile division. He started with U. S. Rubber in 1948 and has held several positions in the division, including assistant to the manager of industrial relations and labor standards.

Changes at Naugatuck Chemical

Four new assignments in the research and development department of Naugatuck Chemical Division were announced June 5. W. F. Tuley was appointed group manager of product development and technical sales service; L. H. Howland, manager of synthetic rubber development; P. M. Elliott, manager of plastics development; and F. L. Holbrook, manager of rubber chemicals development.

Dr. Tuley, formerly technical director of rubber chemicals and synthetic rubber development, joined U. S. Rubber's general laboratories in 1928. He has since served in various production and sales positions and holds several patents for accelerators and antioxidants.

Dr. Howland also started in the general laboratories in 1928 and has had several research and development assignments, most recently as manager of GR-S research and development. He holds numerous patents on rubber chemicals, synthetic rubber, and organic chemicals.

Dr. Elliott began in the general laboratories in 1937 and went to Naugatuck Chemical two years later. He has worked on rubber chemicals and rubber compounding and since 1943 has been associated with plastics development. He was previously supervisor of Kralastic and Vibrin evaluation.

Mr. Holbrook, with the company since 1919, transferred to Naugatuck Chemical in 1931 after assignments in the rubber company's footwear and plantations division. His first post in the chemical division was director of the rubber testing and evaluation laboratories; and he was previously assistant manager of rubber chemicals development and sales service.

3-D Advertising

Three-dimensional color advertising and a three-dimensional color display are being used by U. S. Rubber to show its Elastic Naugahyde plastic upholstery in depth and setting. The company introduced this medium in a four-page color insert in *Retailing Daily* on June 12.

To see the vinyl upholstery in the third dimension the reader employs a pocket mirror to reflect the advertisement to his eyes. Reprints of the ad will be mailed to prospective customers in the furniture field. In addition, a 3-D display for Elastic Naugahyde will be provided to leading furniture manufacturers for use at furniture markets.

Surface for Polyethylene Film

A new process for surface-treating polyethylene film in order to make it more receptive to printing procedures and inks has been announced by the Chester Packaging Products Corp., Yonkers, N. Y. The new treated film, called Cheslene TF, is made of polyethylene resins, product of Bakelite Co. Division, Union Carbide & Carbon Corp., New York, N. Y. The process is claimed to increase ink adhesion, permit higher press speeds, and decrease printing costs. Maximum coverage, high uniformity of impression, and more brilliant colors are also claimed to result from the use of the treated coated film expected to find wide application in packaging.

New American Polymer Plant

A new, modern plant is being constructed by American Polymer Corp., Peabody, Mass., to increase the production capacity of the company for standard products and for specialty polymers and copolymers. The new facility is expected to be completed in 90 days and will supplement present plants of the company which have been modified to compensate for the interruption in production resulting from the recent explosion in the Peabody plant.

The company also announced the appointment of Morell Marean to the position of sales manager. Mr. Marean had been employed by du Pont as Detroit district manager of the electrochemicals department.

Stamford Oil Dispersions

The manufacture of vulcanized oil dispersions by The Stamford Rubber Supply Co., Stamford, Conn., was discontinued as of June 30. The dispersions, which were manufactured under license from patentholder P. Stamberger, president of Crusader Chemical Co., Inc., Baltimore, Md., will be produced by Crusader on or before September 1. The products are principally used as modifiers and extenders for *Hevea*, synthetic, and plastic latices.

New Huntley Sales Agent

Huntley Industrial Minerals, Inc., Bishop, Calif., has appointed Wharton Jackson Co., with offices at 99 Hudson St., New York 13, N. Y., and headquarters in the Petroleum Bldg., 714 W. Olympic Blvd., Los Angeles 15, Calif., as exclusive sales agent.

The new agency will handle the wide range of non-metallic minerals, including talc, pyrophyllite, mica, asbestos, clays, and special aluminum and magnesium silicate pigments produced from mines and plants of Huntley Industrial Minerals in California and Arizona.

Wharton Jackson, head of the sales organization, has been actively engaged in the non-metallics field, mostly in managerial capacities, for more than 20 years and is well known in the ceramic, paint, paper, and rubber industries, as well as the chemical field. He is a member of the American Chemical Society and its Division of Rubber Chemistry, American Ceramic Society, and the American Society for Testing Materials.

Wharton Jackson

Monsanto Advances Several

Lincoln B. Crosby has been named manager of Monsanto Chemical Co. plastics division plant at Springfield, Mass.; and Allen G. Erdman will succeed Crosby as general manufacturing superintendent of the plant's Saflex, Vuepak and sheet departments. These changes are effective September 1.

Crosby replaces Robert M. Morris, recently named production manager of the company's organic chemicals division at St. Louis, Mo.

Crosby joined the plastics division in 1939 and has been a general manufacturing superintendent since 1948. He had previously served as plant manager for Shawinigan Resins Corp., a Monsanto associated company, and as assistant maintenance superintendent at the Springfield plant.

Erdman joined the company's phosphate division at its Anniston, Ala., plant in 1939. He was area superintendent at the Oak Ridge National Laboratories before becoming operating superintendent in the production department at Springfield in 1947 and has been general superintendent in charge of transportation and materials since 1951.

James H. Lum has been appointed director of development for the organic chemicals division. Lum, since 1952 development manager of the phosphate division, succeeds Alfred T. Loeffler, who has accepted an executive position with the chemicals division of Food Machinery & Chemicals Corp.

Lum has been with Monsanto since 1936, when the company acquired the Thomas & Hochwalt Laboratories, Dayton, O., and formed its central research department. He was a group leader there until 1942 and in 1945 was named assistant research director. The following year he was appointed executive director of the Clinton National Laboratories, Oak Ridge, Tenn., an atomic energy installation then operated by Monsanto. Lum was managing director of Monsanto's Australian subsidiary, Monsanto Chemicals (Australia), Ltd., from 1947 until 1951.

Modernization Program

The Mansfield Tire & Rubber Co., Mansfield, O., has embarked on a modernization program which includes the construction of a new facility and the improvement of the company's main plant. The new manufacturing plant, for which excavation work has begun, is expected to be completed by 1954 at a cost in excess of $1,000,000. The one-story structure of brick and steel construction will contain approximately 52,000 square feet of floor space and will be laid out for straight-line production. A three-shift production capacity of 6,000 tires a day is predicted.

This project is the second major modernization program undertaken by the company. The first, which occurred a few years ago, involved the construction of the existing fabric processing plant and the improvement of the inner tube and tire departments of the main plant.

Barco Mfg. Co., Barrington, Ill., has appointed Rawdon Myers Agency, Cincinnati, O., district representative for southern Ohio, southern Indiana, and Kentucky. The Agency will handle the complete line of Barco flexible, ball, swivel, revolving, and swing joints.

Newton H. Tuthill

Tuthill Pequanoc Head

Pequanoc Rubber Co., Butler, N. J., announced on June 9 several executive changes. Newton H. Tuthill was elected to the newly created position of executive vice president and general manager. He was formerly vice president and secretary-treasurer.

Mr. Tuthill has been with the company since 1947 and prior to that time was with the American Hard Rubber Co. on the controller's staff.

Harry W. Chaudoin, assistant secretary at Pequanoc, has been named secretary-treasurer; while Harold Watt takes over Mr. Chaudoin's former duties.

Mr. Tuthill announced that Pendennis W. Reed has resigned as president and general manager of the company in order to devote full time to his family businesses, but will remain on the Pequanoc board.

V. T. Norton, president of American Hard Rubber Co., was elected a director of Pequanoc Rubber Co. to fill the directorship formerly held by the late Thomas N. D. Mace.

Clad Steel at Lukens

The Lukens Steel Supper for the press was held by Lukens Steel Co., Coatesville, Pa., on June 17 at the Hotel Roosevelt, New York, N. Y., for the purpose of introducing some new clad steels. Agitators, heat exchangers, kettles, reactors, etc., fabricated of the material are said to have among its advantages over lined steel the properties of excellent corrosion resistance and good heat transfer.

New Latex Storage Installation

Rubber Corp. of America, 274 Ten Eyck St., Brooklyn 6, N. Y., has completed a bulk storage installation for natural rubber latex at the Army Base at Boston, Mass., operated by Tidewater Terminal, Inc. This installation will enable Rubber Corp. to receive and store bulk shipments of RCMA centrifuged latex at Boston and to give more efficient and speedy service to New England and Midwest users of centrifuged latex in tank cars, tank trucks, and drums. The company will also carry stocks of GR-S latices for distribution in New England.

Host to Race Winner

The winner of the Indianapolis 500-mile Memorial Day Race, Bill Vukovich, was honored on June 1 by the Firestone Tire & Rubber Co., Akron, O., with a press buffet and cocktail party at Toots Shor's in New York, N. Y. Also present at the gathering were Raymond C. Firestone, vice president of the rubber company, and Wilbur Shaw, three-time winner of the racing classic and president of the Indianapolis Speedway.

The winner negotiated the course at an average speed of 128.740 miles per hour, a rate only slightly less than the record set in 1952. Mr. Vukovich's car, as well as those used by all other drivers in the race, was equipped with Firestone tires, and although track and tire temperatures were reported ranging around 130 and 300° F., respectively, not a single case of tread separation or tire failure was reported, and up to 30% increased wear was claimed. The tires used in this year's race were larger in cross-section and greater by 1½ inches in width than last year's model, and they featured a stronger fabric-to-rubber bond and use of a new high-abrasion tire compound.

Safety Record by Firestone

A new world safety record for the rubber manufacturing industry was set by Firestone, with 6,437,375 accident-free hours, as of June 8. The figure was made by the company's Plant 2 in Akron and was officially recognized by the National Safety Council.

Previously the Akron plants of Firestone had held the world record for tire manufacturing plants. The present record, however, gives the company the record for all rubber manufacturing plants in the world.

Fellowship Students Visit Firestone

Five International Road Federation fellowship students from different countries were guests of Firestone International Co., Akron, for a luncheon and a tour of Firestone plants and research facilities as part of their program of visiting major manufacturing concerns in the United States. The students, from Chile, Costa Rica, Belgium, France, and Ecuador, have been in this country for the past year studying engineering courses at Ohio State and Yale universities under the sponsorship of the Federation, an organization formed to promote better highways in other countries.

Magnetic Separators in Reclaiming

The removal of bead wire from cracked tires is being accomplished in the plant of U. S. Rubber Reclaiming Co., Buffalo, N. Y., by the use of permanent magnetic pulleys manufactured by Eriez Mfg. Co., Erie, Pa. Installed as the head pulleys on the belt conveyors which transport the pulverized tire, the separator causes the metal to be carried around the pulley while the rubber scrap is permitted to flow off. The metal then falls off the under side of the pulley on to a conveyor system which carries it to storage yards. It is claimed that use of this system has resulted in the reclaiming of 100% of the rubber and steel which enters the processing plant.

Conlon Succeeds Reuther

Joseph A. Conlon has been appointed vice president of New York Belting & Packing Co., Passaic, N. J., succeeding Ben F. Reuther, who has retired after more than 48 years in the rubber industry. Mr. Reuther will continue in an advisory and consulting capacity.

Mr. Conlon, who will function as the company's senior operating executive, was named vice president in charge of sales in October, 1952. He has been affiliated with the rubber industry since 1930.

Mr. Reuther, a pioneer in the field of industrial rubber products and widely known throughout the belting industry, began his long career with Peerless Rubber Co., Passaic, in 1905. He became sales manager of New York Belting & Packing in 1931 and was made vice president in 1943.

CANADA

Rubber Use, Stocks Decline

Consumption of rubber—natural, synthetic, and reclaim—in Canada in April declined to 7,766 tons from the 8,015 tons used in March; while stocks on April 30 fell to 8,680 tons from 10,287 on March 31, according to the Dominion Bureau of Statistics. Production of synthetic rubber during the month totaled 5,894 tons, against 7,276 in March. The respective figures for reclaim output were 381 and 407 tons.

Consumption of natural rubber in April amounted to 3,090 tons, compared with 3,260 in March. The respective figures for synthetic rubber were 3,400 and 3,408 tons; and for reclaim, 1,276 and 1,347 tons.

Stocks of natural rubber declined from 3,991 tons on March 31 to 3,504 tons on April 30. Synthetic rubber stocks dropped from 4,899 to 3,537 tons; but reclaim stocks rose during the month from 1,397 to 1,639 tons.

Lignin Reinforced Rubber

A new process for improving the properties of lignin-reinforced vulcanizates has been developed in the laboratories of the National Research Council, Ottawa, Ont., Canada. The process uses a composite compounding ingredient consisting of lignin and oxides of metals such as litharge, brown lead, red lead, copper oxide, and bismuth trioxide. These oxides are reported to be effective in inhibiting the cure-delaying action of the lignin and enhancing the tensile strength and resilience of a vulcanizate. In preparing the vulcanizate coprecipitated rubber is used. The zinc oxide may be present as an activator.

It is said that lignin-reinforced rubber produced by this method has a tensile strength up to and over 5,000 pounds per square inch and a Bashore resilience as high as 65%. Patents have been obtained on the process by the Council, and rights under the patents are held by Howard Smith Paper Mills, Ltd. Further information regarding licensing arrangements may be obtained from Canadian Patents & Development Ltd., National Research Bldg., Ottawa.

Financial

Dayton Rubber Co., Dayton, O. Six months to April 30, 1953: net income, $877,271, equal to $1.41 a common share, against $759,021, or $1.31 a share, a year earlier.

Lee Rubber & Tire Corp., Conshohocken, Pa. Six months to April 30, 1953: net income, $815,808, equal to $3.08 a common share, compared with $943,668, or $3.56 a share, a year earlier.

Monroe Auto Equipment Co., Monroe, Mich. Nine months ended March 31, 1953: net profit, $357,545, equal to 81¢ a common share, compared with $147,181, or 24¢ a share, in the corresponding period last year.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
American Hard Rubber Co.	Pfd.	$0 87½ q.	June 30	June 23
Borg-Warner Corp.	Pfd.	0 87½ q.	July 1	June 17
Dayton Rubber Co.	Com.	0 50 q.	July 24	July 9
	Cl. A.	0 50 q.	July 24	July 9
Dewey & Almy Chemical Co.	Com.	0 15 q.	June 20	June 10
Faultless Rubber Co.	Com.	0 15 extra	June 30	June 18
		0 25 q.	June 30	June 18
Garlock Packing Co.	Com.	0 25 extra	June 30	June 18
		0 25 q.	June 30	June 18
General Cable Corp.	Com.	0 15	July 1	June 19
	1st Pfd.	1 00 q.	July 1	June 19
	2nd Pfd.	0 50 q.	July 1	June 19
General Tire & Rubber Co.	4¼% Pfd.	1 0625q.	June 30	June 19
	4¾% Pfd.	0 9375 q.	June 30	June 19
	4¾% 2nd Conv. Pfd.	0 8125 q.	June 30	June 19
Goodall Rubber Co.	Com.	0 15 q.	Aug. 15	Aug. 1
		0 15 spec.	July 1	June 16
Goodyear Tire & Rubber Co.	Com.	1 00 q.	June 30	June 19
	4% Pfd.	0 50 q.	July 31	July 10
Hewitt-Robins, Inc.	Com.	0 50 q.	June 15	June 3
Jenkins Bros.	Fdrs.	1 00	June 26	June 18
	Non-Vot.	0 25	June 26	June 18
Johns-Manville Corp.	Com.	0 75 q.	June 11	June 1
Mansfield Tire & Rubber Co.	Com.	0 40 q.	June 19	June 10
Midwest Rubber Reclaiming Co.	Com.	0 25 q.	July 1	June 8
Mohawk Rubber Co.	Com.	0 25 extra	June 30	June 13
		0 25 q.	June 30	June 13
O'Sullivan Rubber Corp.	5% Pfd.	0 25 q.	July 1	June 20
Raybestos-Manhattan, Inc.	Com.	0 50 q.	June 12	May 29
A. G. Spalding & Bros., Inc.	Com.	0 25 q.	June 15	June 8
U. S. Rubber Reclaiming Co.	Pfd.	0 35 q. accum.	July 1	June 19
United States Rubber Co.	Com.	0 50	June 13	May 25
	8% 1st Pfd.	2 00	June 13	May 25

NEWS ABOUT PEOPLE

William E. Hansen

William E. Hansen has been added to the technical sales staff out of the Akron general offices of Harwick Standard Chemical Co. Mr. Hansen started with Ansbacher Siegle Corp. in 1932, in its color laboratory, while he was attending college. Later he worked in the research, production control, and customer service laboratories for a six-year period. Then he was transferred to Cleveland, O., to serve as district sales manager and served as such 15 years. Mr. Hansen is a member of the Cleveland Paint, Varnish & Lacquer Association, the Division of Rubber Chemistry of the American Chemical Society, and the Akron Rubber Group.

Walter Lincoln Hardy has been promoted to director of engineering at Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y. Mr. Hardy joined Snell as director of package engineering in 1952. In his new position he will be in charge of the design, construction, and sales of the Snell packaged spray dryer. His division will also be responsible for research and development in the design of all types of chemical processing equipment and complete chemical processing plants. Other activities will include the design of plants for new processes or for the operation of old processes at improved efficiency, the specification of equipment and materials, construction supervision and initial plant operation, plant and chemical processing equipment appraisal, overall plant surveys for cost reduction, disposal or utilization of industrial by-products, the selection and specification of plant sites, buildings, transportation facilities, raw materials, utility supply, economic factors, and market surveys. Mr. Hardy has had an extensive background in petroleum, packaging, and corrosion engineering, covering a wide variety of industry. He is also a member of numerous technical associations.

John R. Hoover, president, B. F. Goodrich Chemical Co., a division of The B. F. Goodrich Co., has been elected a director of the Manufacturing Chemists' Association. He succeeds **William S. Richardson,** executive vice president at Goodrich, on the association's board for three years.

Henry S. Curtis has been advanced to the post of manager of production and engineering of Diamond Alkali Organic Chemicals Division, Inc., to succeed **Charles H. Kolker,** resigned. Mr. Curtis will make his headquarters at the division's plant at Houston, Tex. Mr. Curtis spent nine years in various operating and engineering capacities at the Westvaco Chemical Division of the Food Machinery & Chemical Corp. and then, during World War II, was assigned to certain key supervisory and operational posts in the Chemical Warfare Service. From 1946 until 1950, Mr. Curtis was plant manager of the new vinyl chloride plant of Glenn L. Martin Co. in Painesville, O., and continued in charge of the operation following the plant's acquisition by United States Rubber Co. Mr. Curtis joined Diamond in January, 1951, as assistant general superintendent at the government owned magnesium plant operated in Painesville by Diamond Magnesium Co., a subsidiary of Diamond Alkali. In August, 1952, he was appointed chief engineer of the latter's newly formed Organic Chemicals Division.

Lawrence Robert O'Rourke has been appointed a sales executive of Pennsylvania Industrial Chemical Corp., with headquarters at the plant in Chester, Pa. Mr. O'Rourke had been associated with Falk & Co. for 15 years, where he engaged in production, control, research, and sales activities.

Lawrence Robert O'Rourke

De France Clarke, Jr., has been appointed product manager for fine chemicals of Carbide & Carbon Chemicals Co., a division of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y., and will be responsible for the market development of certain nitrogen, chlorine, and sulfur compounds as well as intermediates for the pharmaceutical and rubber chemical industries. Mr. Clarke joined the company in 1940 and was assigned to Carbide & Carbon's Fellowship at Mellon Institute. He later served as technical representative in the New England area and then moved to the fine chemicals division, where he assisted with the market development of aryl chemicals and the new coal hydrogenation products.

Harry M. Brubaker has been advanced from assistant sales manager to sales manager of the carbon black division of Witco Chemical Co., 260 Madison Ave., New York 16, N. Y. Mr. Brubaker has been with the company about two years. He has been associated with the carbon black industry for a number of years and prior to that time had been employed by The B. F. Goodrich Co. He will continue at Witco's Akron office. Mr. Brubaker is a member of several rubber groups and the Division of Rubber Chemistry, American Chemical Society. He is treasurer of the Akron Rubber Group and a director of the Southern Ohio Rubber Group.

Harry M. Brubaker

Alfred G. Cobbe is now with the research and development department of Cabot Carbon Co., Pampa, Tex., subsidiary of Godfrey L. Cabot, Inc., Boston, Mass.

Gustavus J. Esselen III has been appointed New York sales representative for the plasticizer division of Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., and will be serving plastics manufacturers in New York and northern New Jersey, with headquarters in the Empire State Bldg., New York, N. Y. Son of the late Dr. G. J. Esselen, noted Boston research leader, Mr. Esselen was formerly employed by U. S. Testing Co., Inc., in a sales and administrative capacity.

Thomas D. Cabot, executive vice president of Godfrey L. Cabot, Inc., Boston chemical manufacturing firm and manufacturer of carbon black, was commencement speaker at exercises held at Morris Harvey College in Charleston, W. Va., May 26, and was made recipient of the honorary degree of Doctor of Laws. The citation concluded: "In honor of his industrial and financial statesmanship, in gratitude for his ready guidance in our national affairs, in appreciation of his wise concern for education, in admiration for his broad and humane interests, and in commendation for the high integrity and well-used talents with which he has become one of our country's builders, it is a privilege to present for the degree of Doctor of Laws Thomas Dudley Cabot."

Charles W. Grubb

Charles W. Grubb has been named sales manager for the New England states, with headquarters in Boston, Mass., for Witco Chemical Co., 260 Madison Ave., New York 16, N. Y. Mr. Grubb, a salesman in the Boston office for three years, succeeds Goodwin Bangsburg as sales manager. The former is a member of the Boston Rubber Group, the Rhode Island Rubber Club, and the New England Paint, Varnish & Lacquer Association.

W. C. T. Utley has been appointed traffic manager of the Sid Richardson Gasoline and Carbon companies, Fort Worth, Tex. Mr. Utley has been associated with traffic 35 years, having started with the T. & N. O. Railroad in 1918. After further employment in various capacities with several railroads he became assistant treasurer of the Merchants Cold Storage Co. Next, after three years with Sheppard Field Air Force Post Exchange as exchange supervisor, he was made vice president and general manager of the Pecos Valley Southern Railway Co., which also operated the Pecos Valley Southern Transport Co. In 1950, Mr. Utley entered the traffic department of Consolidated Vultee Aircraft Corp. in Fort Worth as supervisor of the administration section of its traffic department, which position he resigned on May 31 to join the Richardson companies.

James M. Hannan has been advanced to assistant manager of the Detroit sales division of The Standard Products Co., Cleveland, O. The company's sales have doubled in the past year, and Mr. Hannan will assist W. H. Thourlby, manager, in a general expansion of the sales division's services to customers. Mr. Hannan has served in the Detroit sales division for five years as an account executive and as sales manager of the company's Gaylord (Mich.) division. He was a commander in the Navy during World War II and before then was associated with Macy's in New York.

S. R. Zimmerman, Jr., was elected a director of Raybestos-Manhattan, Inc., Passaic, N. J., at a board meeting on June 17. Mr. Zimmerman served at the company's United States Asbestos Division as an industrial engineer, in the laboratory and engineering department, and was appointed assistant general manager of the Division in January, 1953.

Carl H. Zieme, after 42 years with the Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, O., retired June 30. Mr. Zieme started with Republic in July, 1911, and spent the first five years in the laboratory as a chemist, including material control, compounding, and design. He later assumed the position of manager of hose departments and for 12 years was technical superintendent. He has held his present position of service engineer since 1932. Mr. Zieme has represented Republic on technical sub-committees on national industrial and manufacturers associations relating to rubber and industrial rubber products for many years. A few of the organizations in which he has been active are: American Society for Testing Materials, since 1915; Rubber Manufacturers Association Technical Committee, of which he was chairman for several terms, since 1920; American Petroleum Institute, on the Manufacturers Engineering Committee on Belting and Rotary Drilling Hose, since 1933.

Margaret Brittan of The Baker Castor Oil Co., 120 Broadway, New York, N. Y., was installed as president of The Women's Traffic Club of New York, Inc., on June 9. Mrs. Brittan has been in the traffic department of the Baker company since 1945.

Morris S. Rosenthal, president of Stein, Hall & Co., Inc., New York, N. Y., on June 4 at a general luncheon-meeting of the National Council of American Importers, Inc., was presented with a plaque for "Distinguished Service to the United States Import Trade." This award is a most unusual one, and the presentation to Mr. Rosenthal was only the second time in the history of the Council that such recognition has been made.

C. A. Litzler, consultant and authority on the continuous processing of tire cord and fabric, has left for a four-week visit to Italy, Germany, France, and England for a series of conferences with technical and managing directors of leading European tire producers. His newly formed firm of C. A. Litzler Co., Inc., Cleveland, O., is specializing in technical assistance to tire manufacturers regarding the latest methods of processing the newer synthetic materials for tire fabrics.

Sam I. Roudebush has been appointed assistant manager of tire design for Seiberling Rubber Co., Akron, O. He joins Seiberling after technical service with The General Tire & Rubber Co., as a development engineer, and with The B. F. Goodrich Co. with assignments in Akron, Los Angeles, and Colombia.

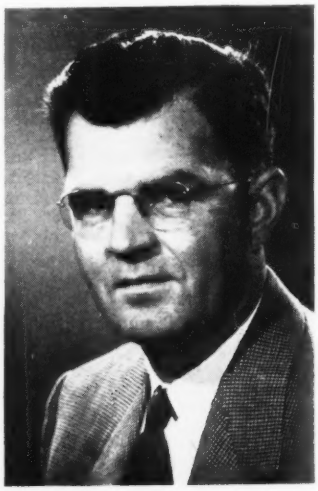
W. H. Oburn, assistant treasurer and one of the first employes of Seiberling Rubber Co., Akron, O., has retired after more than 31 years with the company, which he had joined as credit manager in 1922, shortly after the company was founded. Prior to this date he had been with the Goodyear Tire & Rubber Co. for 11 years. Oburn held many positions in the sales and operating departments at Seiberling—including western sales division manager, manager of branch operations, and manager of dealer development—before he was promoted to assistant treasurer in 1947.

Fred M. Pugh has been appointed sales representative for the General Electric silicone products department to industries in central and eastern Ohio, with headquarters at the company's chemical division office at 1105 Chester Ave., Cleveland, O. Formerly a silicone sales representative in Cincinnati, Mr. Pugh has been a headquarters sales specialist at Waterford, N. Y., since 1950 and, for the past year, has supervised the sale of G-E silicones to the rubber industry.

L. M. Atwood has been named to the newly created position of administrative assistant to the director of sales for the Boston Woven Hose & Rubber Co., Cambridge, Mass. With the company five years, Mr. Atwood has held such positions as western manager of the V-belt department, assistant sales manager, and director of general sales. Prior to his association with the Boston firm he was a sales engineer with Gates Rubber Co. in eastern Iowa and western Illinois.

R. M. Junker has been appointed manager of the newly combined departments of tank lining and industrial roll sales in Goodyear Tire & Rubber Co.'s industrial products division. He joined the company in 1942 and was assigned to the efficiency department, later doing wage analysis. He served in the U. S. Navy from 1944 until 1946, then returned to Akron to Goodyear's tank lining sales staff. Junker was appointed manager of industrial roll sales in 1948.

H. Herman Abernathy has been named to the newly created post of assistant sales manager—technical, by the rubber chemicals division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. He will assist O. M. Hayden in supervising technical activities of the division's sales organization as well as work performed in the rubber laboratories at Deepwater Point, N. J., and Akron, O. Mr. Abernathy joined du Pont's Jackson Laboratory staff in 1939 and the following year transferred to the rubber laboratory for research and development work on latex and latex chemicals, becoming latex division head in 1946. Since 1952 he has been engaged in new products development work for the rubber chemicals division.



H. Herman Abernathy

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CIRCOMAR-5AA A free-flowing, dark liquid softener of the asphalt-flux type.	In the manufacture of tires of natural rubber, GR-S polymers, or blends of these two.
CIRCOMAR-25 A heavy, viscous, dark liquid softener of the asphalt-flux type.	In the manufacture of tires of natural rubber, GR-S polymers, or blends of these two.
CIRCOMAR-110 A very low-cost soft asphaltum.	In the manufacture of tires.
SUNDEX-53 A low-cost, relatively aromatic product highly compatible with natural rubber and GR-S polymers.	In the manufacture of oil-extended polymers. In the processing of tires, rubber footwear, matting, toys, semihard rubbers, etc. In extending high Mooney viscosity Neoprene WHV.
SUNDEX-41 A complex dark-colored blend of high mol. wt. petroleum fractions and a specially prepared asphaltum, all derived from selected sources.	For processing "cold rubber."
516 RUBBER PROCESS AID A highly paraffinic type product.	In the manufacture of butyl inner tubes.
PDO 40 RECLAIMING AID A dark-colored product composed of polymerized olefinic hydrocarbons generally cyclic in character.	As a reclaiming agent.
SUNAPTIC ACID A saturated high mol. wt. type naphthenic acid.	In Neoprene latex compounds to eliminate irregularities in the surface of coagulated dip films. As an activating agent in the curing of rubber. May be used as a direct replacement for stearic acid.
SUNOCO ANTI-CHEK A tailor-made petroleum wax.	For protecting rubber from surface cracking caused by sunlight, ultraviolet light, ozone.
SUNOCO WAXES 1290 Yellow 1290 Brown Carefully refined microcrystalline waxes having a melting point of about 180 F.	As mold releasing agents.

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Karl P. Goodwin has been elected second vice president and director of sales of the rubber division, Acushnet Process Co., New Bedford, Mass. He was with Remington Arms Co. prior to joining Acushnet as draftsman in the engineering department in 1938. Advanced to the position of assistant to the chief engineer, he later became assistant factory manager. Following the two years he represented the company as a sales engineer in the field, he was named sales manager of the rubber division, a position he has held for the past eight years. His former duties now are augmented by those of his new office.

Richard A. Steenrod has been named silicone sales representative at Cincinnati, O., for the General Electric Co.'s silicone products department. Mr. Steenrod joined G-E in 1949 as a member of the chemical and metallurgical training program. After completing the course he held various silicone engineering and marketing positions at Waterford, N. Y.

Gerald Reinsmith, formerly chief of the Non-Metallic Structural Materials Unit, Office Chief of Ordnance, Department of Army, is now manager of Narmco Industries' office at 500 Walker Bldg., 734 15th St., N.W., Washington 5, D. C. Narmco plants are located in Costa Mesa, San Diego, and La Mesa, Calif.

Dr. H. R. Ehrhardt has been added to the industrial medical staff of The Goodyear Tire & Rubber Co., Akron, O.

James K. MacDougall has been appointed director of industrial relations for Seiberling Rubber Co., Akron, O. He comes to Seiberling from Harshaw Chemical Co., where he served in a similar capacity for the past seven years. Previously he had been with Borg-Warner and the Cleveland Trust Co. In his post at Seiberling, MacDougall will assume duties of **Wilfred Andrew,** factory personnel administrator, who has been granted an extended leave of absence, and who, upon his return, will be assigned new duties.

William B. Sinclair, formerly with the Westvaco Chemical Division of Food Machinery & Chemical Corp., has been appointed New England sales representative of the chemical division of Celanese Corp. of America, with headquarters at 140 Federal St., Boston, Mass.

T. R. Penisten has been appointed sales representative of the Goodyear Tire & Rubber Co.'s metal products division and will contact truck, bus, and agricultural machinery manufacturers in the company's eastern territory. Penisten, who recently joined Goodyear, has had wide experience in the agricultural equipment field.

John B. Gregory has joined Frederick S. Bacon and Philip D. Wilkinson as partners in the Frederick S. Bacon Laboratories, Watertown, Mass. During the war Mr. Gregory was a Sections Chief in the Chemical Warfare Service Development Laboratories at MIT and for the past seven years has been in charge of the Bacon Laboratories' rubber and plastics division. He currently is director of the Elastomers & Plastics Group of the Northeastern Section of the American Chemical Society.

OBITUARY

Sumner Simpson

AFTER a long illness Sumner Simpson, chairman of the board, Raybestos-Manhattan, Inc., Passaic, N. J., died June 13 at a hospital in Bridgeport, Conn.

He was born in Pittsburgh, Pa., on May 17, 1874. He received his formal education in the local public schools, then went to work for Westinghouse Corp. in Pittsburgh. He transferred to Bridgeport in 1907 to become assistant to the works manager of Union Metallic Cartridge Co.

Mr. Simpson started his long and successful association with Raybestos in 1911 and was largely responsible for the merger that resulted in Raybestos-Manhattan, Inc., in 1929. He became president of the new organization, a position he resigned on April 6, 1948, when he was made chairman of the board.

The deceased was well known as a philanthropist and civic leader. He was also the first president of both the Community Chest and Rotary Club of Bridgeport and a past vice president of the Union League Club of New York.

He leaves a son, a daughter, two grandsons, and a sister.

Sidney V. Smith

A CEREBRAL hemorrhage caused the death, in New York, N. Y., on June 11, of Sidney Vere Smith, chairman of the board of directors of Binney & Smith Co., 41 E. 42nd St., New York 17, which he had joined on January 2, 1912, as a crayon salesman.

He was also a director of Columbian Carbon Co., Stover Lock Nut & Machinery Corp., and Cosmic Crayon Co. The deceased held memberships in the Union League Club, St. George Society, Blind Brook, Everglades, Bath & Tennis, and Greenwich Country clubs, the Musketeers, and the Masonic organization.

Mr. Smith was born in New York on June 2, 1892.

Funeral services were held June 15 at Christ Church, Greenwich, Conn., followed by burial in Kensico Cemetery, Valhalla, N. Y.

Survivors include the widow, two daughters, and a sister.

Anthony J. Math

AFTER a brief illness Anthony J. Math, chairman of the board and president of Sinclair & Valentine Co., 611 W. 129th St., New York 27, N. Y., died in a New York hospital on May 13.

Born in La Grange, Tex., April 22, 1900, Mr. Math came to New York when he was quite young and at the age of 15 started with Sinclair & Valentine as an office boy. Promotions followed, and he was elected president of the organization in 1945 and chairman of the board last year.

In 1945, Mr. Math became interested in rubber and plastic dispersed colors and in 1946 absorbed Sulco, Inc., which later became a division of Sinclair & Valentine.

The deceased devoted much time to charitable and religious organizations and was a Knight of Malta and on the Cardinal's Committee of the Laity. He was also active in the Lithographic Technical Foundation, the research and the education councils of the Graphic Arts Industry, National Assn. of Printing Ink Makers, the National Printing Ink Research Institute, Printers Supply Salesmen's Guild of New York, Executives Assn. of New York, Uptown Chamber of Commerce, New York Board of Trade, Red Cross, Police Athletic League, and the Salvation Army, among others.

Burial took place following a Solemn High Requiem Mass at St. Patrick's Cathedral, New York, on May 16.

Survivors include the widow, a daughter, and three sons.

R. W. Eckstein

R. W. ECKSTEIN, 46, manager of tank lining sales in the industrial products division of Goodyear Tire & Rubber Co., Akron, O., died recently following an illness of nearly two months.

A native of Galion, O., he attended public schools there.

He started with Goodyear in the factory and later joined the company's training squadron. After this training he entered tank lining sales as a clerk in 1938, became assistant manager of the department in 1946, and later the same year was elevated to the department managership.

The deceased was a member of the Trinity Evangelical Church, Joppa Lodge of the Masons, and the Executive Club of Akron. He was active in Sea Scout work until recent years.

He is survived by his wife, a son, his mother, a sister, and a brother.

Funeral services were held in Akron, with burial in Rose Hill Cemetery.

Aden Miller

ADEN MILLER, a government rubber official with the Office of the Rubber Director during the Second World War and more recently with the National Production Authority and the Office of Price Stabilization, died suddenly on June 6 in Hyattsville, Md.

Mr. Miller was long affiliated with The B. F. Goodrich Co., as a sales representative in the Baltimore area, and later with Rubber Millers, Inc., in Baltimore. He joined the War Production Board in 1942 as a dollar-a-year consultant on rubber mechanical goods and moved to the Office of the Rubber Director of WPB in 1943.

Subsequently he served with the rubber division of the Civilian Production Administration and the Office of Materials Distribution of the United States Department of Commerce, peacetime successors to WPB. He rejoined the government shortly after the Korean outbreak, serving with the NPA Rubber Division from the Autumn of 1950 until the Winter of 1952, holding the post of Chief, Technical Branch, NPA Rubber Division, when he transferred to the OPS, as Assistant Chief of the Rubber Branch. At the time of his death he was Washington representative for Hewitt-Robins, Inc.

He was born in Canton, O.

He was a graduate of Purdue University, a past president of Maryland Fishing Club, and a member of the Washington Rubber Group and of the Kiwanis.

Mr. Miller is survived by his wife and three children.

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EVERY so often, a machinery maker comes to the Timken Company for help with a very special bearing application. Something, he's pretty sure, we've never encountered before.

Almost always, we're able to give him a pleasant surprise. In over 50 years of helping manufacturers with special bearing problems, all the while improving our designs, we've produced an astonishing variety of tapered roller bearings. So many sizes and shapes that the "new" bearing has usually already been designed and made by the Timken Company. So many that the "new" design problem has usually been already solved with the help of Timken Company engineers.

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Be sure that every bearing you use in the machines you buy or build is stamped with the trademark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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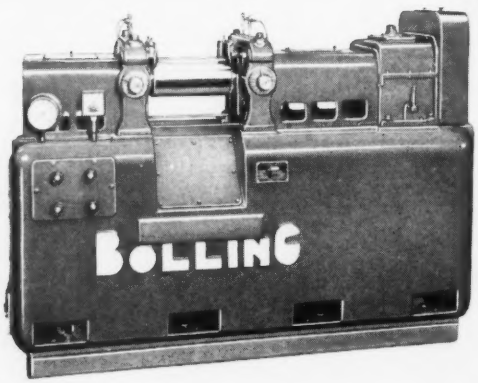
New Machinery



Bolling Fully Enclosed Laboratory Mill

Laboratory Roll Mill

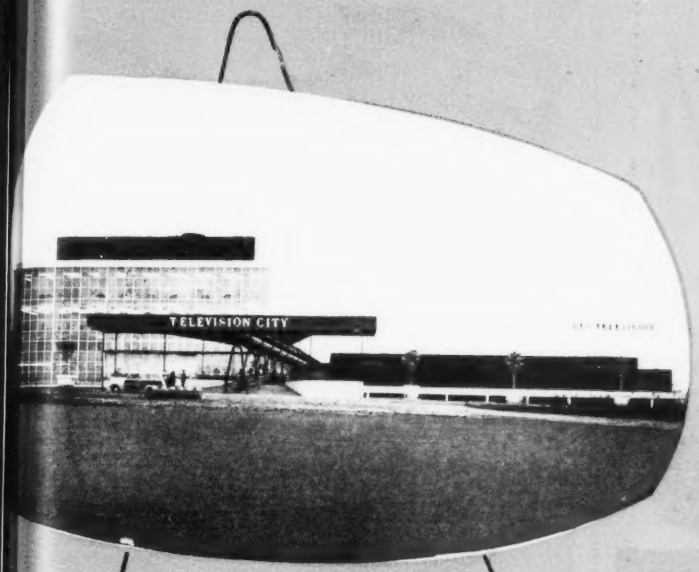
A DELUXE two-roll laboratory mill for processing plastics and rubber has been announced by Stewart Bolling & Co., Inc., 3190 E. 65th St., Cleveland 27, O. The machine has chrome-plated rolls, six inches in diameter and 13 inches long, which are driven by large universal joints. The rolls rotate on Timken anti-friction roll bearings equipped with a full flood lubricating system. The drive is by a 7½-hp. gear-motor having an enclosed disk-type brake, including control. Other features include splash-lubricated, helical cut gearing; built-in piping for steam and water; all parts except rolls fully enclosed; stainless steel guides; push-pull type of thrust screws; and a knee-operated safety switch.

Power Roller Die Machine

THE Falls Engineering & Machine Co., Cuyahoga Falls, O., has announced a new power roller die machine for cutting out shapes and strips of foam, sponge, rubber, and rubberized hair. Designed by Campbell Machinery Development Co., also of Cuyahoga Falls, the machine is made in four sizes with bed cutting areas of 3, 6, 15, and 24 square feet. A time saving of up to 90% over that required by other cutting methods is claimed for the unit.

In operation, the material to be cut is placed over the steel rule dies, and a steel roll is passed over the material forcing it

SEE PAGE 424



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CBS Television's multi-million dollar Television City in Hollywood, California. The first building to be designed strictly for telecasting. this ultramodern structure contains the latest electronic and electric equipment, four enormous studios, and advanced design facilities to improve telecasting.

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Campbell Roller Die Cutter, and Operation Close-up

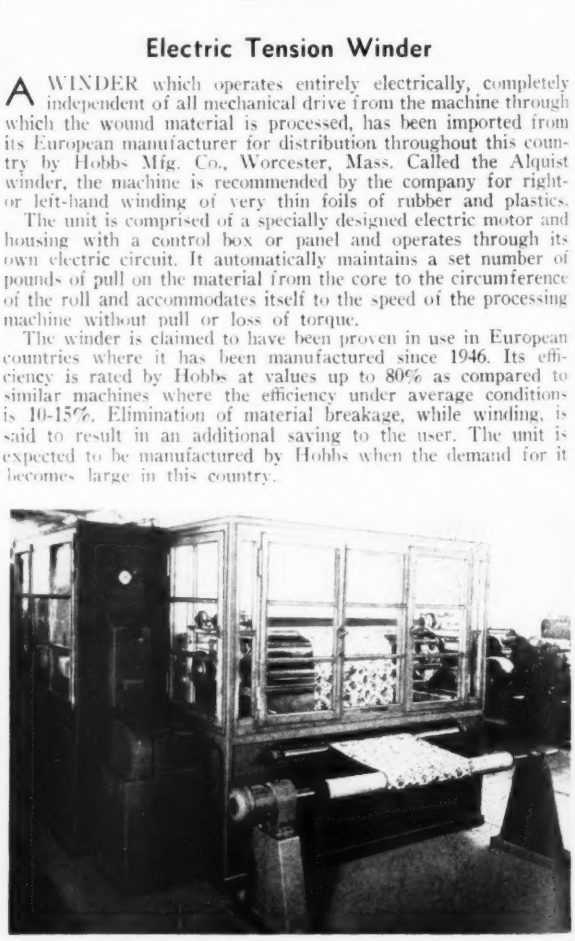
down on to the dies. Auxiliary roll stands used to feed roll stock to the machine in individual sheets or in laminated thicknesses are available as optional equipment. The cutter may also be adapted to power feed or to power wind-up.

Electric Tension Winder

A WINDER which operates entirely electrically, completely independent of all mechanical drive from the machine through which the wound material is processed, has been imported from its European manufacturer for distribution throughout this country by Hobbs Mfg. Co., Worcester, Mass. Called the Alquist winder, the machine is recommended by the company for right- or left-hand winding of very thin foils of rubber and plastics.

The unit is comprised of a specially designed electric motor and housing with a control box or panel and operates through its own electric circuit. It automatically maintains a set number of pounds of pull on the material from the core to the circumference of the roll and accommodates itself to the speed of the processing machine without pull or loss of torque.

The winder is claimed to have been proven in use in European countries where it has been manufactured since 1946. Its efficiency is rated by Hobbs at values up to 80% as compared to similar machines where the efficiency under average conditions is 10-15%. Elimination of material breakage, while winding, is said to result in an additional saving to the user. The unit is expected to be manufactured by Hobbs when the demand for it becomes large in this country.



Hobbs Alquist Winder

EFFECT OF OZONE EXPOSURE ON ELASTOMERS (135 P.P.M. OZONE)

	DEGREE OF EXTENSION	BEHAVIOR IN OZONE
ELASTOMER "A"	65%	FAILED, 35 MINUTES
ELASTOMER "B"	25%	FAILED, 39 MINUTES
"HYPALON"	200%	NO EFFECT AFTER 3½ HRS.

OZONATOR TESTS SHOW

A Wellsbach "Ozonator" was used to create ozone concentrations up to 135 parts per million at a test temperature of 158°F. Tests were conducted on specimens clamped around mandrels, and on strips mounted on racks.

DU PONT HYPALON*

CHLOROSULFONATED POLYETHYLENE

has Complete Ozone Resistance

The complete ozone resistance of Du Pont "Hypalon" chlorosulfonated polyethylene suggests a wide variety of uses in the rubber industry—for "Hypalon" alone, as well as in blends with other elastomers. White sidewalls for automobile tires need the resistance to cracking that this ozone resistance gives. Other uses indicated by this property of Du Pont "Hypalon" include automotive weather-stripping, coated fabrics, spark plug boots and wire covering.

And ozone resistance is only one of a unique combination of properties "Hypalon" offers. These properties point to such varied uses as electrical insulation and jacketing, footwear, floor covering, conveyor belt covers, gaskets, O-rings, diaphragms, linings for chemical handling equipment, acid hose, steam hose coverings and molding forms and bags.

Perhaps Du Pont "Hypalon"—or a blend containing "Hypalon"—can help you develop a new or improved product. "Hypalon" is now available in limited commercial quantities.

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- **COMPLETE OZONE RESISTANCE**
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- **GOOD HEAT RESISTANCE**—Suitable for continuous service up to 250 F. and intermittent service at higher temperatures.
- **EXCELLENT CHEMICAL RESISTANCE**
- **UNLIMITED COLOR POSSIBILITIES.** Does not require carbon black to achieve maximum physical properties.
- **EXCELLENT FLEX-LIFE**

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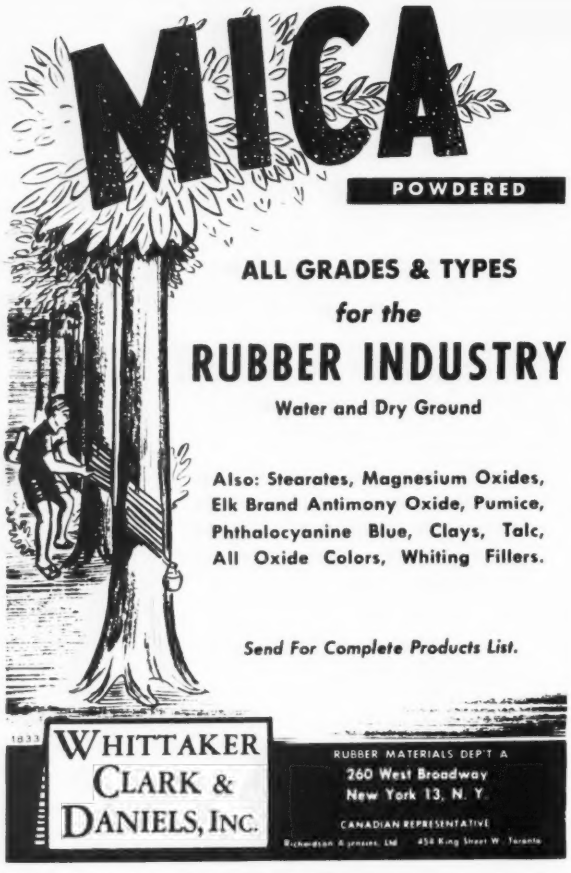

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New Materials

Stabilizer for PVC—Stabelan HR

A NEW stabilizer, Stabelan HR, with reportedly excellent heat and light resistant properties in polyvinyl chlorides and their copolymers, has been announced by Harwick Standard Chemical Co., 60 S. Seiberling St., Akron, O. The material is a synergized and chelated cadmium and barium compound that is a heavy paste at 75° F. and becomes more fluid as the temperature increases. Other data include: ash content, 23±1%; volatile loss at 350° F. for one hour, 5±1%; specific gravity, 1.15 at 25° C.; and water solubility, 0.01% at 75° F.

The stabilizer is claimed to be easily dispersed in dry preblends, with or without premixing with plasticizer prior to incorporation into the blend, and in solutions and dispersions. It is also recommended as a stabilizer for acrylonitrile elastomers used as partial plasticizers in PVC and for inorganic and organic pigments.

Harwax A—12-Hydroxy Stearic Acid

W. C. HARDESTY CO. OF CANADA, LTD., Toronto, Ont., Canada, has announced the availability of Harwax A, a commercial grade of 12-hydroxy stearic acid, consisting of 85% of the 12-hydroxy acid with the remaining percentage made up chiefly of normal stearic acid. Specifications given for this fatty acid include: boiling point, 170° F.; free fatty acid content (as oleic acid), 86-90%; acid number, 171-179; saponification number, 185-195; iodine value (Wijs), 1-5; titre, 70-75° C.; and hydroxyl value, 140-150. The material is produced in slab form and packaged in 50-pound cardboard cartons.

Granulated Wood Binding Resin

THE availability of a phenolic resin, Resinox 743, for use as a binder for granulated wood such as sawdust and other wood wastes has been announced by the plastics division of Monsanto Chemical Co., Springfield, Mass. The new product is said to be finely divided, non-lumping, high flowing, and fast curing. It is reported to have been used successfully in the mass production of items such as furniture, toys, and housewares. Properties of granulated wood which has been bonded together with this material are said to include good strength, good screw-holding power, and high resistance to water.

Low-Shrinkage Silicone Rubber

GENERAL ELECTRIC CO., Pittsfield, Mass., has announced a new low compression-set silicone rubber molding compound said to produce parts with only half the shrinkage, after molding, of conventional silicone rubber compounds. Designated SE-360, the material may be used in molds originally designed for producing natural and synthetic rubber parts.

The compound is recommended for use in applications where the part must remain effective under sustained pressure such as in engine packing and O-rings. The new material is reported to have a compression set of 8% after 22 hours at 300° F.; 1% water absorption after immersion for one week at 70° C.; and a total linear shrinkage of 3% after oven cure. The conventional press cycles of about 15 minutes at 250° F. can be used, followed by a 24-hour oven cure at 480° F. to obtain the manufacturer's stated physical properties.

The silicone rubber compound is currently available as a 60-durometer compound. It can be used as base stock and modified by rubber fabricators to yield 70- or 80-durometer compounds.

"**Kel-F**: Physical, Electrical, Chemical and Mechanical Properties." Technical Bulletin 1-3-53. M. W. Kellogg Co., Jersey City, N. J. 6 pages. The properties and applications of Kel-F (trifluorochloroethylene) polymers are described in this revised and expanded data bulletin.

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SPECIFY EMERY FATTY ACIDS *everytime!*

Good news about Plasticizers!

Plastolein Plasticizers will soon be available in increased quantities at lower prices. Now's the time to investigate these important plasticizers in vinyls, cellulosics and synthetic rubbers:

Plastolein 9050 DHZ
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Plastolein 9057 DIOZ
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Plastolein 9058 DOZ
(di-2-ethylhexyl azelate)
Plastolein 9055 DGP
(diethylene glycol dipelargonate)
Plastolein 9250 THFO
(tetrahydrofurfuryl oleate)
Plastolein 9715 Polymeric
Plastolein 9720 Polymeric

In selecting the constituents that go into your products, you can't be too careful in getting the highest quality available, consistent with performance requirements and cost limitations.

When it comes to fatty acids, this careful selection always leads to Emery...because Emery Fatty Acids are safeguarded by modern processing methods and strict control of specifications, compositions and stability.

These advanced processing and control methods have been an outgrowth of Emery's pioneering in better and unique processes and products exemplified by the following innovations.

Emersol Solvent Crystallization Process
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For strong color on the light side use RED 297; for darker mass tone with slightly bluer cast use RED 347; for still darker mass tone with a little bluer cast use RED 387.

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New Goods

New Goodyear Puncture Seal Butyl Truck Tube Retains Air after Numerous Punctures

Butyl Puncture-Sealing Truck Tubes

A NEW line of Puncture Seal truck tubes made of butyl rubber has been announced by Goodyear Tire & Rubber Co., Akron 16, O. In addition to providing the toughness, heat resistance, and air retention qualities of butyl, the new tubes are said to incorporate improvements in the sealant and process of manufacture that prevent air leakage for much longer periods while the puncturing object remains in the tire. An outstanding feature is the fact that the sealant in the tube will not flow, so there is no danger of the tire becoming unbalanced at high speeds and high temperatures. The new tubes are available in a wide range of truck tire sizes.

Flexible Vest for Dry Cells

A FLEXIBLE vest, designed to keep walkie-talkie radio batteries warm and functioning in sub-zero temperatures, has been developed by the United States Signal Corps Engineering Laboratories and made by The B. F. Goodrich Co., Akron, O. Designed to wear under the overcoats of foot soldiers, the shaped-to-body rubber vest weighs slightly more than three pounds and can accommodate 117 dry cells of pencil-stub size. The cells, interconnected by flexible wires within the vest to form the equivalent of a conventional battery, supply the necessary energy to function the radio.

Walkie-Talkie Funcrioning on Dry Cells Contained within Rubber Vest

Rubber Welding Hose

THE development of an improved rubber hose for gas welding apparatus has been announced by Hewitt-Robins, Inc., Stamford, Conn. The new hose is claimed to be capable of withstanding greater heat and flame than any previous hose. It is also said to be light in weight and resistant to grit, sharp metal, and oil.

The hose is constructed of a rayon reinforced carcass, which reportedly provides greater strength and longer life than the conventional cotton reinforcement, and has a neoprene cover. The hose consists of two separate tubes, vulcanized together to eliminate twisting and knotting of the separate lines.

"sequence control cams" are CUSTOM BUILT on NRM TIRE BUILDING MACHINES

Here, an NRM technician makes a final check on the sequence control system of an NRM Tire Building Machine. Basically, it is a standard model. But out of sight behind the panel of electronic impulse switches is the vital "sequence control cam", which is *custom built* to synchronize the work of the unit smoothly with other tire production equipment in the customer's plant. In fact, the "sequence control cam" on this — and on every NRM Tire Building Machine — is built to the customer's *own* specifications.

For the last 25 years, in large and small rubber plants the world over, NRM rubber processing equipment has consistently proved itself to be of the most practical — and productive — basic design. And, as the rubber industry knows, the individual attention given *all* NRM machines during construction and in final adjustment, insures their perfect integration with other plant equipment, and increases production "flow" all down the line.

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The hose has a working pressure of 200 psi. and will be furnished in lengths up to 500 feet in various diameters to fit any type of welding apparatus.

Plastic Beach Board

A BUOYANT plastic beach board, molded in one piece from Marvinol vinyl plastic, product of Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., has been developed by Sponge Rubber Products Co., Shelton, Conn. The board, called Water Wonder, is said to be capable of supporting up to 150 pounds in water and is intended for use in sports or swimming instruction.

Vinyl Water Wonder Beach Board

The unit has a smooth outer skin and a sponge-like interior composed of many tiny nitrogen containing cells which provide buoyancy to the board. It reportedly will not absorb water, break in normal usage, or lose its shape. The integral colors will not fade under the effects of sunlight or weathering, it is further claimed. Specifications include: length, 22 inches; weight, 12 ounces; and colors, blue, red, and yellow.

Hose-Type Sprinkler

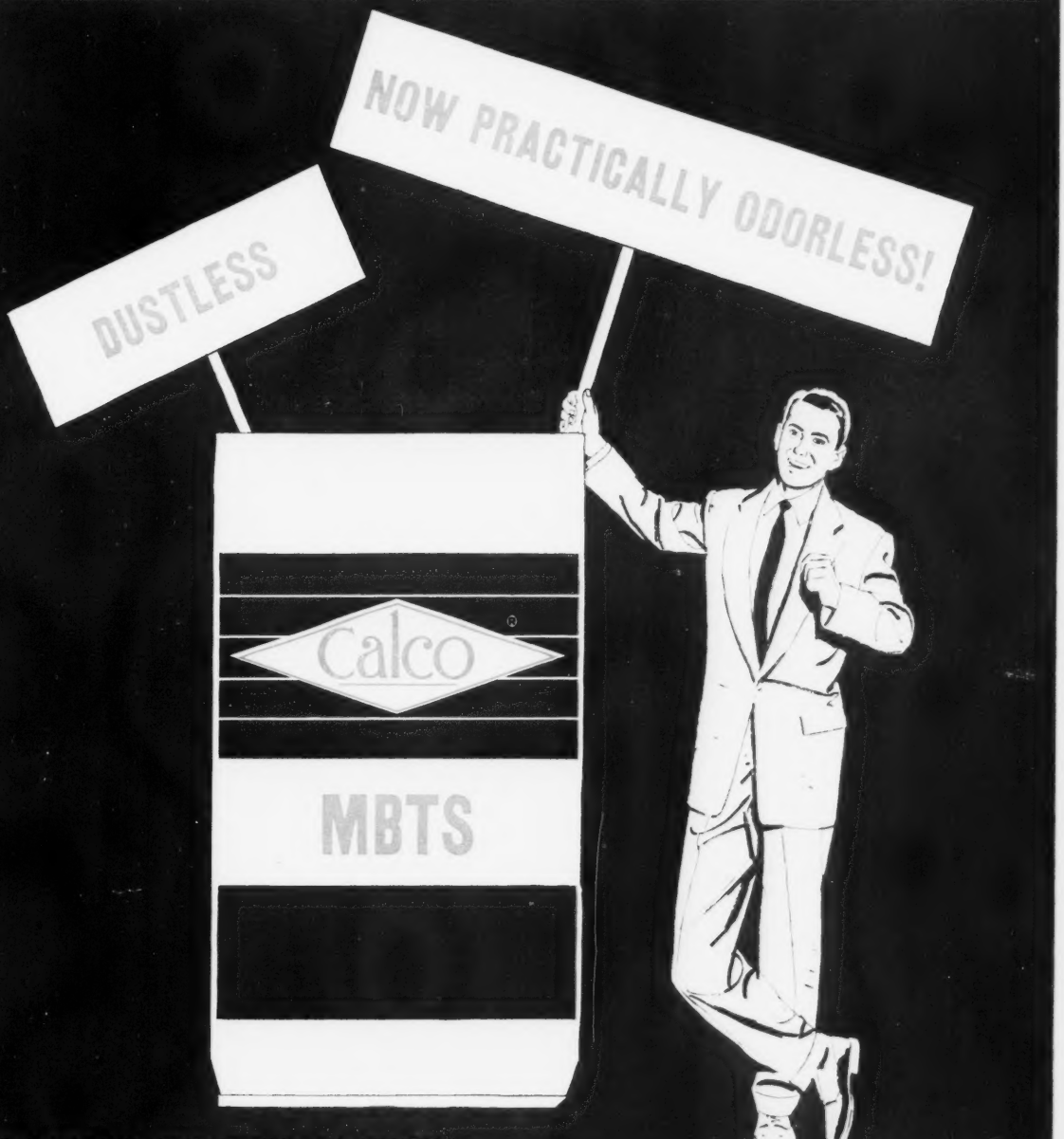
A NEW flexible sprinkler, consisting of three parallel tubes linked together in one plane, is being produced by Industrial Synthetics Corp., Garfield, N. J. This Supplex Flexible Sprinkler, made of vinyl plastic, has small slits on the upper side of the tubing which remain closed until a pressure of 25 psi. is exerted by the water; the slits then open to emit uniform jets upward and outward to cover a 20-foot wide section of garden or lawn. The sprinkler may also be employed as a soaker by turning it upside down.

New Flexible Sprinkler of Three-Tube Construction

Ribbon-Type Sealer

A CLOTH-REINFORCED synthetic rubber sealer in ribbon form intended for use as a weather and water resistant seal between adjacent surfaces has been announced by Minnesota Mining & Mfg. Co., St. Paul, Minn. Designated EC-1202, the material is reported to be capable of application by simply laying or pressing the ribbon on one surface before riveting, screwing, or bolting the second surface to the first.

Adhesion properties are claimed to be such that the ribbon will stay in place on vertical or overhead surfaces during assembly operations. Good dimensional stability is claimed for the product, which exhibits high resistance to deterioration, but no resistance to oil, gasolines, and other solvents. The ribbon sealer is available as packaged rolls in 1/32- and 1/16-inch thicknesses, in seven widths ranging from 1/4-inch to two inches, and in lengths of 100 and 200 feet.



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Then we took most of the odor out of it—left it practically odorless, to contribute further to good working conditions.

But we've left the efficiency in! **CALCO MBTS is still unsurpassed as a readily dispersible, high temperature accelerator.**

It pays to specify CALCO MBTS.

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• When you plug in the MAIMIN STRIPOMATIK, you're boss of the world's most powerful, portable cutter. Guided by its sturdy gauge, the Stripomatik knife zooms through stubborn rubber straight as a die. Special rollers speed cutting without friction. Note water cooler. Mount two or more Maimin Stripomatiks within production line for automatic cutting and edge trimming. Save man hours and man energy with Maimin Stripomatiks now. Write H. Maimin Co., Inc., 575 Eighth Ave., New York 18.

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Eagle-Picher manufactures a comprehensive line of both lead and zinc pigments for the rubber industry. The quality and uniformity of our pigments, exact quality control methods of manufacturing, more than a century of experience . . . are the factors that make Eagle-Picher *serve you better.*

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SOUTH AMERICA

BRAZIL

New Way to Prepare Rubber

Efforts are being made in Brazil to generalize a new method of preparing rubber that has already been introduced in the Cuiaba, Rosario Oeste, and Diamantino districts of the Mato Grosso rubber areas. There the rubber gatherer, or seringueiro, as he is called, has abandoned the time-honored practice of preparing his rubber in the shape of balls by alternately dipping a paddle into latex and drying over a smoke fire for the new method, resulting in the so-called "Sernambi Cochos."

The "cochos," rectangular blocks, are prepared in the simplest way. The seringueiro taps and puts his latex cups in place as usual, but does not empty the cups until the following day, by which time the latex has undergone spontaneous coagulation. The rubber is then collected, and it is then pressed and shaped into blocks..

The advantages of the new over the old process are said to be many. Tests at the Instituto Tecnologia de Sao Paulo have shown that the mechanical properties of the cochos are markedly superior to those of the best para, the Acre Fine. The new method is more profitable and less onerous to the seringueiro, for under the new system he makes the rounds of the trees only once a day since he taps the trees and collects the previous day's crop, in the same trip; whereas formerly he made two trips, one to tap the tree and put the latex cups in place, and the second to collect the latex. Moreover he can eliminate the time-consuming labor of dipping and smoking his latex. Thus he is able to tap about twice as many trees as before and still has time left to produce food crops.

If generally adopted, the system would benefit the rubber industry by providing a single type of rubber; while the country at large would be served by the possibility of increased production of rubber to cover its needs and by the greater prosperity among seringueiros.

Other Industry News

Brazil's 1952 rubber production totaled 33,249 tons (26,600 tons dry weight), against 26,245 tons (20,996 tons dry weight) in 1951. The considerable advance in last year was said to have been due to higher prices, improved financial aid given to producers by the Amazon Credit Bank, and increased production propaganda. Despite the rise in domestic output, 10,578 tons of natural rubber—twice the 1951 figure of 5,120 tons—had to be imported during the year to keep manufacturers supplied and at the same time to enable the Amazon Credit Bank to maintain the large reserves legally required. At the end of 1952 the Bank is said to have held 10,019 tons of domestic natural rubber (almost half of which was in consuming centers) in addition to 6,112 tons of imported natural rubber.

Reports of a scheme for the establishment of a synthetic rubber plant in Sao Paulo are again being published. The large imports of natural rubber and the growing needs of manufacturers, expected to be about 40,000 tons dry weight in 1953, have prompted the new move, it is said.

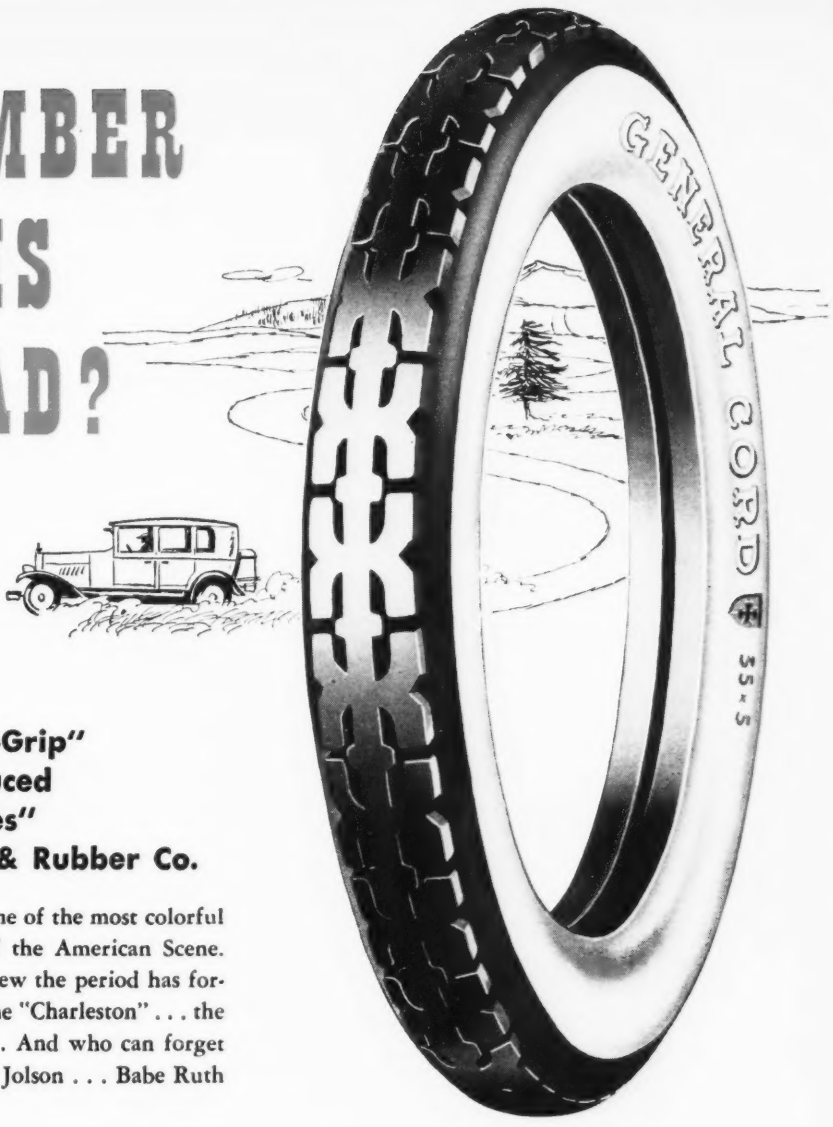
Hitherto the government seems to have adopted a cautious attitude, being understandably loath to give too much encouragement to an undertaking that might jeopardize the home natural rubber industry. About two years ago a scheme had been rejected chiefly because it was considered inadequate. Whether the latest plan has proved more acceptable to the government is not known as yet.

Dunlop do Brazil has increased its share capital from 50,000,000 cruzeiros to 200,000,000 cruzeiros, of which 125,000,000 cruzeiros is held by the parent company. Dunlop is now erecting a large factory for tires and other rubber goods at Campinas near Sao Paulo, which is expected to go into production toward the end of the year.

Polyvinyl chloride is to be manufactured by Geon do Brasil-Industria e Comercio, Sao Paulo, recently formed with Brazilian and United States capitol. A factory is under construction at Sao Caetana do Sul, near the caustic soda plant of the largest shareholder, S. A. Industrias Reunidos F. Matarazzo.

For what it is worth, we add the rumor that a Sao Paulo company (Koppers has been named) is considering the erection of a polystyrene plant in this city.

REMEMBER THIS TREAD?



It is the tread of the famous "Dual-Grip" Cord Balloon, introduced early in the "twenties" by The General Tire & Rubber Co.

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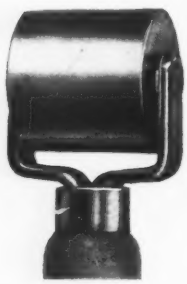

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ARGENTINA

A shortage of foreign exchange caused the Argentina Government to suspend further imports of natural rubber in July, 1952. To stretch available supplies, tire manufacturers were limited in September, 1952, to 75% of the average consumption of rubber for passenger-car tires in the first half of the year. To aid the rubber industry the government sold from its stock 3,000 tons to tire manufacturers and 2,000 tons to other manufacturers. This move enabled the former to get through the rest of the year comfortably though the latter had to resort to the use of reclaim wherever possible.

Statistics of rubber consumption reflect this situation to some extent; whereas 1951 figures were put at 18,000 tons of natural rubber, 1,000 tons of natural rubber latex, and 1,000 to 1,500 tons of reclaim, those for 1952 were reportedly 16,400 tons natural rubber, 1,000 tons latex, 400 tons synthetic rubber, and about 3,200 tons of reclaim. It was said that if more synthetic rubber had been available, as much as 3,000 tons would have been used.

Reclaimers, of whom there are understood to be 13, produced 2,750 tons, chiefly alkali reclaim in 1952, almost double the 1951 total.

In January, 1953, the industry was assured of a nine-month supply of rubber. The government had announced it was issuing permits for 14,375 tons of crude rubber, of which 9,375 tons were intended for the tire industry; while the rest would be distributed to other consumers.

Trade sources show production in 1952 included 664,757 passenger-car tires, 417,858 truck and bus tires, and 17,501 tractor and implement tires. Corresponding figures for tubes were 600,800, 377,812, and 10,435 units, respectively.

Official figures for 1951 put total tire production at 1,012,500 units, and production of tubes at 1,053,400 units. There was also an estimated output of 17,500,000 pairs of rubber and rubber-soled footwear in 1952, against 16,200,000 pairs in 1951.

FAR EAST

MALAYA

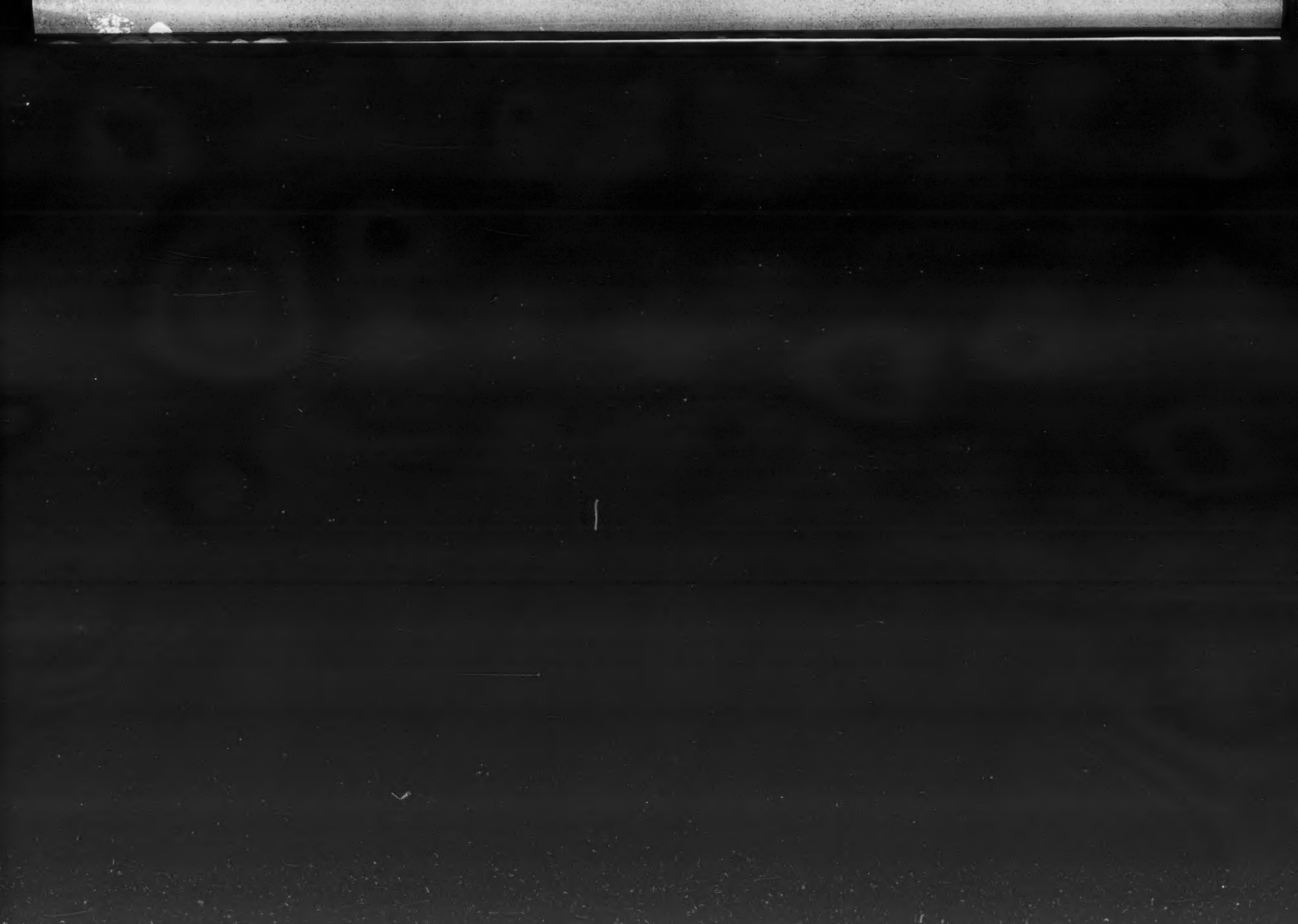
Fact-Finding Committee for Rubber Industry

The report of a possible appointment by the Malayan Government of a fact-finding mission on the rubber industry, mentioned in these columns last month, has meanwhile been confirmed. On May 12 it was officially announced that an independent committee, selected from persons not resident in Malaya, is to investigate the competitive position of the rubber industry in Malaya and will make recommendations. The Rubber Producers' Council of Malaya has agreed to this investigation and has decided to set up a joint working party which will assemble and collate information for the mission.

The terms of reference of the mission are: (1) taxation of the industry in relation to costs of production; (2) maintenance of existing capital in the industry and attracting of fresh capital for development; (3) replanting; (4) marketing and processing of smallholders' rubber; (5) unemployment in the industry in the event of a recession in prices.

Unlike the earlier report of an inquiry, the news of the fact-finding mission has met with no opposition from rubber growers and dealers who, on the contrary, have been practically unanimous in their declarations of willingness to cooperate. According to press statements, they feel they have nothing to hide and can face a probe; at the same time estate owners have made it clear that there must be no disclosure of "secrets" since such disclosure might lead to exploitation by the workers and "unscrupulous" overseas rubber importers.

Sterling companies in London have also accepted the mission, although there are those who reportedly are inclined to believe that the proposed undertaking is a waste of time, money, and energy; however, its usefulness from a political standpoint is conceded. On the other hand, the composition of the committee, the political leanings and impartiality of individual members are arousing uneasy speculation. Apparently it is feared that the mission might include persons who, called upon to investigate an industry, would feel



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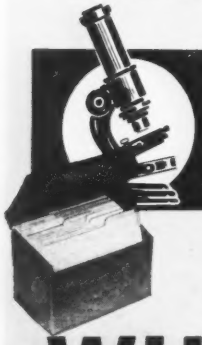

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obliged to find something to expose. At the same time it is noticeable that many in rubber circles seem to find nothing strange in the fact that an investigation, suggested in the first place by the Whitton arbitration board to make it possible to resolve in a fair way to the parties concerned the problems raised in the wage dispute between the Rubber Workers' Union and the employers, has been narrowed down to omit all reference to wages and related labor interests.

The *Malay Mail* contents itself with noting, in the course of an editorial discussion of the rubber mission, that the question of pay for rubber workers is a vital one, but "one apparently with which the mission will not concern itself."

The *Straits Times* adopts a more positive attitude and denounces terms of reference which exclude wages and other labor matters, which it considers a fundamental part of the problems of the rubber industry without which the mission's conclusions could not be complete and might be false.

The Rubber Workers' Union of Malaya naturally took the omission of the question of wages seriously; it appealed directly to the government, underlining the necessity of investigation of the wage structure and into the efficiency of the industry; it warned that without this, serious labor unrest might result. A strike, involving the greater part of estate labor, would have to be called if the wage award made by the Whitton Arbitration Board last October was not accepted by employers, the Union warned.

Recent Rubber Developments

The *Planters' Bulletin*, published by the Rubber Research Institute of Malaya, in its May issue noted the following developments:

Budwood of 16 RRI clones was sent to Ceylon for testing resistance to mildew of clones derived from PB 86 seedlings.

From the United States Department of Agriculture, Panama, seed of a blight-resistant clone, FX25, was obtained, from which 300 seedling have now been established in a nursery.

In connection with experiments in treating *Hevea* with bark stimulants and injecting copper salts into trees to increase yields, it has been found that concentrated latex from such trees has shown no abnormalities.

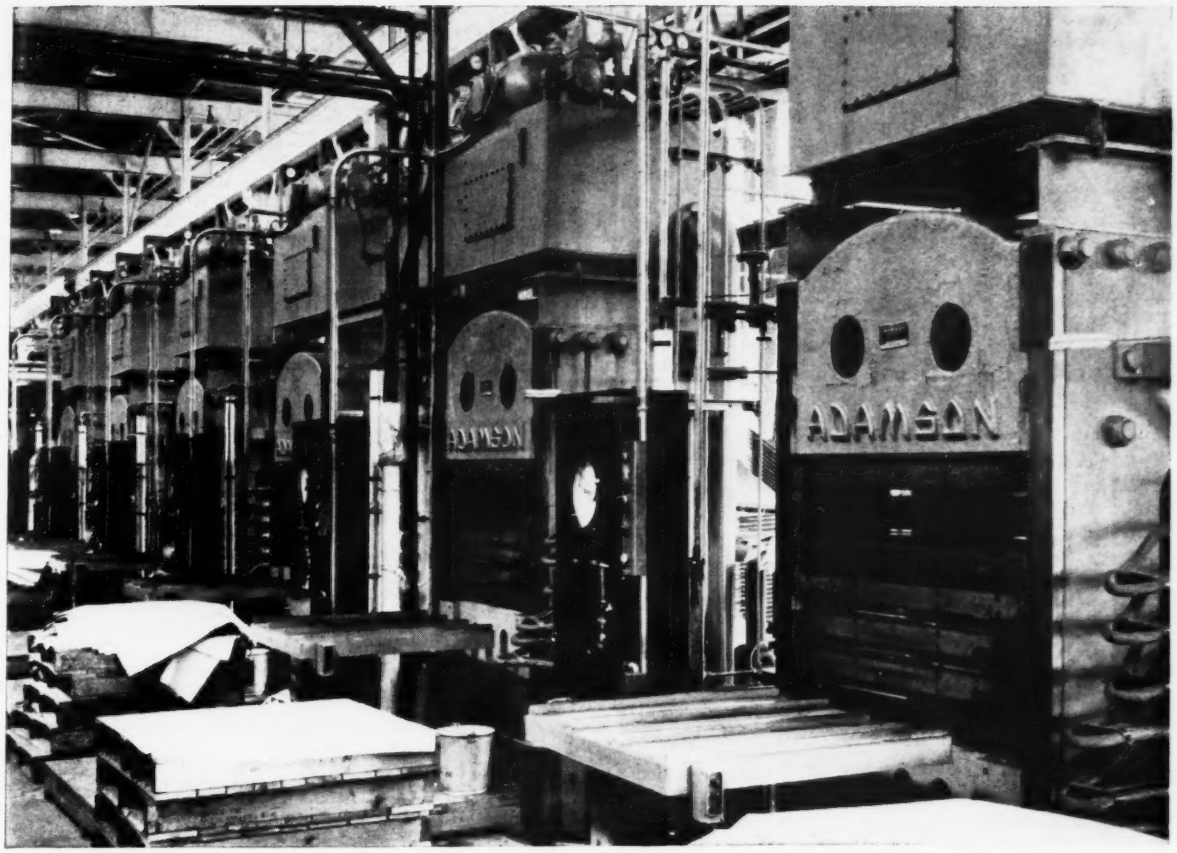
Methods of improving bare back baling are being studied at the Rubber Research Institute of Malaya. Trial shipments in fiberboard cases have been arranged.

CEYLON

Ceylon Blameless for Rubber-Rice Deal

As certain remarks on Ceylon's sale of rubber to China, contained in the final report to the United States Congress on the

SEE PAGE 424



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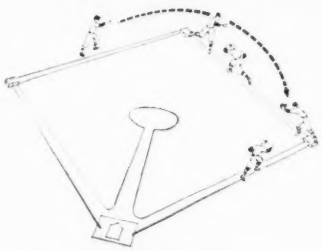

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Battle Act, by Averill Harriman, appeared to blame Ceylon for the failure of the Ceylon-United States rubber negotiations, the Ceylon Government issued a statement in which events leading up to the China-Ceylon deal were reviewed. The chief points made were:

(1) In its proposals for bulk purchases of rubber from Ceylon the United States had throughout insisted on Singapore prices, even when it had arranged for purchases from other countries, specifically Thailand in June, 1951, at world market prices.

(2) Ceylon received no direct reply from the United States to her statement of her case for exemption from the Kem Amendment (which provided that countries that did not abide by the resolution of the U.N. banning export of strategic materials to China and North Korea would forfeit United States aid, unless specially exempted), only representations that continued failure by Ceylon to ban rubber exports to China made United States aid impossible. On the other hand India, Pakistan, Indonesia, United Kingdom, Canada, and several European countries had been granted such exemption.

(3) In the final attempt, in July, 1952, to reach an agreement on rubber, and at the same time get financial aid and badly needed rice, at a time when the United States knew that Ceylon was considering a rubber-rice contract with Red China, the United States offered rice at the open market price, which had been refused for Ceylon rubber, and "no doubt made it clear that a satisfactory settlement of these matters (i.e. financial aid and a rubber agreement) would be expected to lead to a stoppage of rubber exports to China." The negotiations with America fell through, and in September, 1952, the first Ceylon mission went to China.

The Ceylon Government did not think it necessary to accept or repudiate blame for the failure of negotiations with the United States or to make any plea for the agreement with the Chinese Government, the statement continued, and closed with the affirmation of Ceylon's "complete sympathy with the democratic world in its opposition to Communism," but added the parting shot that Ceylon could not be a party to any policy which sacrified economic well-being for political expediency.

From reliable sources the *Natural Rubber News*, of April, gathers that the American position seems to be: that the United States insisted on a world market price rather than a premium price for rubber; that in the proposed rice purchases Ceylon had refused to meet free export price; that the United States had not acceded to a request in the later negotiations for a $50,000,000 contribution to a joint five-year plan of economic development because the sum was considered more than could be effectively utilized, and because Congress could not be committed to a program of the kind; that the United States had offered instead an agreement similar to that made with India and Pakistan, which Ceylon had rejected.

Apparently further to justify Ceylon's stand, the Commerce Minister, R. G. Senanayake, stated early in March that the rubber-rice pact with China was working because the Commonwealth was behind Ceylon; British ships were bringing the China rice. Furthermore, if Ceylon needs money and food, she must get them, and the deal had added an extra 100,000,000 rupees to the national funds.

Reports current in April, that attempts would be made by Britain and the United States to persuade Ceylon to cancel her rubber pact with Red China, or to reduce rubber sales, were met by declarations of Ceylon's determination to stand by her agreement, and faith in China which so far had adhered strictly to the terms of the pact.

In order not to antagonize Western Governments, which have banned such trans-shipments, the Ceylon Government on March 24 also decided to refuse further permission to private business to import rubber from Malaya and India, and steel from Japan, for reexport to Communist China.

Earlier in the month, it had been announced that export of all Ceylonese rubber to Communist China would be a government monopoly, and leaders were notified that no further permits would be issued to private trade for export of any kind of rubber to China.

BURMA

Last March, Burma decided to ship rubber to Communist China, and in this connection the government issued an order, effective April 1, 1953, forbidding the export of rubber, including plants, seeds, latex, and all products, without licenses. At the end of March, a Polish freighter arrived at Rangoon to load 1,500 tons of rubber for China; on May 26, the Government of Burma reportedly licensed an additional 2,500 tons, for which a Polish vessel was again apparently available.

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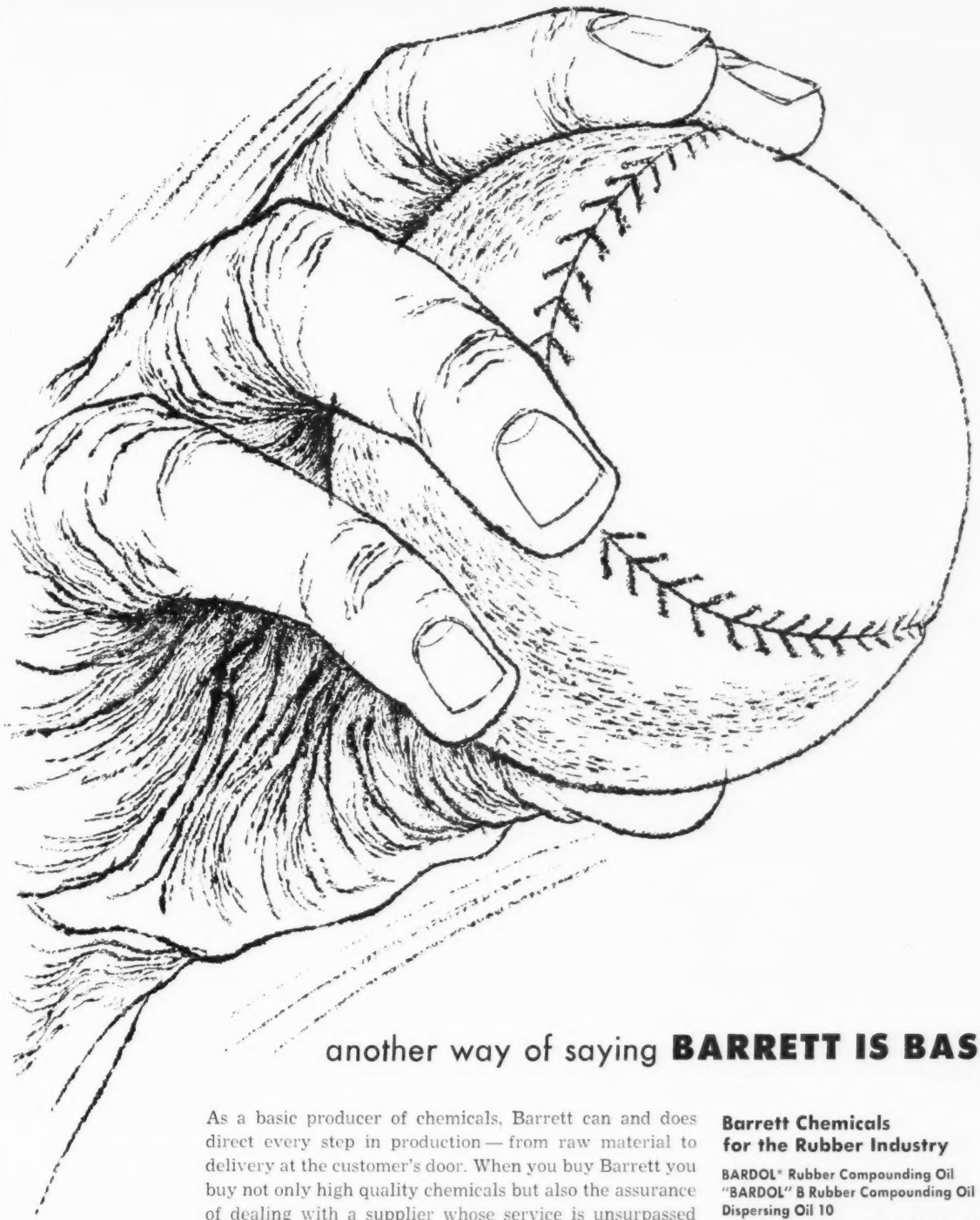

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Editor's Book Table

BOOK REVIEWS

"Chemistry of the Metal Chelate Compounds." Arthur E. Martell and Melvin Calvin. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Cloth, 6 by 9 inches, 624 pages. Price, $13.50.

This book presents an excellent survey of the current state of development of metal chelate compounds which are encountered in almost every field of chemical activity, ranging from dyestuffs to food products. In the rubber industry, for example, chelating agents are used to remove copper and manganese ions and prevent embrittlement; and chelating agents are used as latex stabilizers to prevent decomposition, coagulation, and sludge formation.

Topics covered in the text are methods of determining the presence of chelates; stability constants; influence of the structure of the chelating agent; effect of metal ion; bond type; structure of chelate compounds; catalytic effects of chelate compounds; separation of metal ions; and uses of chelating agents. Appendices include tables of stability and thermodynamic constants, a glossary of terms, and a discussion of optical activity. Many tables and diagrams are used to clarify the text, and the inclusion of a very extensive and up-to-date bibliography adds to the value of the book.

"Die Palarnatur des Kautschuk. (The Polar Nature of Rubber)." Dr. Heinrich Feuchter. Publishers, Verlag fur Radio-Foto-Kinotechnik, GmbH, Berlin, for *Kautschuk und Gummi*. Cloth, 6 by 8¼ inches, 224 pages. Illustrated.

As a long sub-title explains, this is a contribution to the knowledge on racked rubber and vulcanization, the development of a valence lattice from the carbon atoms, and shell aggregation in total rubber, gutta percha, and balata.

The author, engaged in rubber research 40 years, will be recalled as the discoverer in the 1920's of the racking effect in rubber. In his earlier work he used D-rubber (commercial rubber purified by diffusion), but the present results are based chiefly on experiments on Total, or T-rubber, that is, latex (concentrated centrifuged latex) spontaneously evaporated, then purified by diffusion in a solvent, followed by acetone extraction.

He begins by showing the physical unity (single phase structure) of this Total rubber within the temperature range of 11 to 45° C., which he considers the pure elastic state, characterized by the racking constant 8, a swelling constant 4, and a critical melting point at 11° C. (by "melting point," he means the transition temperature from the elastic-rigid to the elastic-soft state of frozen or racked rubber). Then he goes on to develop his valence lattice, using as basis the elementary rubber crystal (C_5H_8)s.

The fact that rubber strips, when thermally relaxed after racking, often assume assymetrical shapes, suggested assymetrical butadiene, having one terminal carbon with three free valences, while the other has a single free valence, as the building unit instead of the isoprene chain. Then he proposes a provisional model, in which eight assymetrical butadienes are linked in such a way as to form a cube when in each corner is positioned a carbon with three valences, while the eight side chains, each with a single free terminal valence, extend into space in line with the major diagonals of the cube. This three-dimensional structure is called a spherane; it is considered the elastic unit of rubber; the cube at its core is the octocarbon; it is the most sensitive part of the whole, and it is here that most of the chemical reactions take place; for instance, in the vulcanization of rubber, octavalent sulfur settles in its center.

A side chain of a spherane links its free valence with that of a side chain of another spherane, forming an octatriene, the linear structural element in the valence lattice. A third unit in the lattice is the three-dimensional octooctatriene, a truncated octahedron which has six octocarbons instead of points and which has eight sides formed by eight octatrienes; a fourth unit, also three-dimensional, results from the combination of six octooctatrienes.

The straight-line valence lattice thus designed serves the author throughout as basic model which is modified as required to illustrate his ideas as he develops them. From it is derived the polar valence lattice of rubber as colloid, when the octocarbon is no longer a cube, but a sphere with eight poles, giving a valence octet. This valence complex as a whole is freely movable over the spherical surface, and the individual valences can displace each other.

Both lattices are expanded structures in which the spheranes

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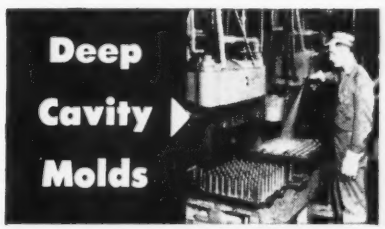

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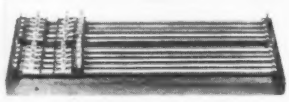

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occupy, respectively, 16 and eight times the space occupied by the elementary crystal. When compressed to fit the space of the latter, the octatrienes, instead of extending in a straight line, are seen to hang down in an arc between the octocarbons to which they are anchored, like a rope slackly hung from two points. The octatrienes and each of their respective links are freely movable in the space between the octocarbons (the elastic space). The valence lattices, together with shell aggregation—to which the author devotes a relatively large amount of space—serves him in the interpretation of a variety of physical and chemical problems in rubber (racking, compounding, mastication, vulcanization, elastic recovery, aging) and also in gutta percha, balata, plastics; and he draws on known observations on heat, snow, and water, among others, further to help clarify his ideas.

This little book is full of ideas and suggestions; in fact, a mere transcription of the heads and sub-heads of the 40 sections into which it is divided would exceed available space. The book has a number of clearly printed illustrations and diagrams, listed at the back, but there is no index (probably not necessary because of the detailed table of contents).

NEW PUBLICATIONS

"Baldwin SR-4 Model M Portable Strain Indicator." Bulletin 4103. Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. 2 pages. A description of a newly improved SR-4 portable strain indicator with self-contained A.C. power pack mounted inside the instrument case appears in this bulletin.

"Silastic Newsletter." Vol. 1, No. 1. Dow Corning Corp., Midland, Mich. 2 pages. This letter discusses Silastic in the following capacities: qualification for AMS and SAE-ASTM specifications; as seals for hydraulic fluids; resistance to fungi; water absorption of types 50 and 80; and uses for the coated cloth. The coloring of types 50 and 80 is also dealt with.

"Silastic 50." Silastic Facts 9-324. 2 pages. Specifications, physical properties, and information on curing, shipping, and applications of this silicone rubber stock are given.

"Qualification of Silastic for Various Silicone Rubber Specifications." Silastic Notes 9-207. 2 pages. This letter contains a list of the various stocks which meet AMS and SAE-ASTM specifications, plus several stocks which meet most, but not all, of the requirements of these specifications.

"Santicizer 160." Technical Bulletin 0-92. Monsanto Chemical Co., St. Louis, Mo. 9 pages. The physical and chemical properties of this primary plasticizer, butyl benzyl phthalate, along with its compatibility with a number of the more common resins, are given in this publication.

"Hycar Technical Newsletter." Vol. 2, No. 6. B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. 4 pages. The use of lubricants, curatives, loading and reinforcement materials, and softeners in Hycar extrusion recipes is discussed, and data on the physical properties of Hycar compounds which employ oil-treated sulphur are given.

Publications of The British Rubber Producers' Research Association, 48 Tewin Rd., Welwyn Garden City, Herts., England.

No. 172. **"Abrasion of Rubber by a Needle."** A. Schallamach. 20 pages. Drawing a needle across rubber compounded with and without carbon has been found to result in the formation of continuous and discontinuous grooves, respectively.

No. 173. **"Initiation Efficiencies in Olefinic Autoxidations."** L. Bateman and A. L. Morris. 7 pages. Azo-bis (isobutyronitrile), benzoyl peroxide and cyclohexenyl hydroperoxide have been investigated in this respect and rates of chain starting resulting from their use have been estimated.

No. 174. **"The Interfacial Activity and Composition of Bovine Serum Albumin plus Sodium Dodecyl Sulfate Complexes."** E. G. Cockbain. 8 pages. It is reported that well defined complexes form in solutions of pH 5.6 and 9.2 and that, in the absence of buffer salts, interfacial tensions increase over a short range of sulfate concentrations.

No. 175. **"Cold Mastication of Rubber."** W. F. Watson. 10 pages. The different chemical processes involved in the plasticizing of rubber by cold and hot mastication are discussed. The cold mastication process was investigated, and an interpretation of the process, supported by experimental data, is given.

"Neoprene Notebook." No. 54. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 8 pages. Applications of neoprene as a lining to resist abrasive sand, as hose coverings in grease refining and in die casting plants, as seats in valves, as a diaphragm in pumps, and in other uses are described. In addition, the first in a series of articles designed towards correcting the confusion of rubber terminology within the industry is included.

"Monex—General-Purpose Ultra Accelerator." Compounding Research Report 22. Naugatuck Chemical, Division of United States Rubber Co., Naugatuck, Conn. 14 pages. The properties, recommended applications, and suggested recipes for use of this accelerator, tetramethylthiuram monosulfide, are given.

"E-S-E-N, Retarder or Antiscorch for Processing Safety." Compounding Research Report No. 23. 12 pages. The physical and compounding properties of E-S-E-N in general, and in specific rubbers in particular, are given in this brochure along with a comparison of this material with other retarders in Paracril rubber.

"Witco Continental Rubber Blacks." Witco Chemical Co., 260 Madison Ave., New York 16, N. Y. 4 pages. A listing of the company's carbon blacks and comparable blacks for the rubber industry, including four grades of channel blacks and five grades of furnace blacks, is given in this desk card.

"Witco Continex FEF (Fast Extrusion Furnace Black) in Natural and Chemical Rubbers." Bulletin 53-5. 16 pages. The properties of this material are compared with competitive FEF blacks in natural rubber, regular GR-S, butyl, Hycar, and neoprene (Types GN and W).

Publications of The B. F. Goodrich Co., Akron, O.

"Rubber and Koroseal Sundries." 54 pages. The complete sundries line of the company plus the price list for the items shown are contained in this catalog.

"Koroseal Upholstery." 12 pages. This brochure describes and illustrates the complete line of Koroseal upholstery material. The 20 basic patterns and typical applications of the material are also shown.

"ASTM Standards on Plastics." American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. 705 pages. Price, $5.25. This paper-covered book gives 135 standards, including specifications, methods of testing, nomenclature, and definitions, for a wide range of plastic molding compounds and for material made from these compounds in the form of sheets, rods, tubes, and shapes.

"ASTM Standards on Electrical Insulating Materials (with Related Information)." 1953 Edition. 590 pages. Price, $5.25. This book, with heavy paper cover, contains the latest approved forms of 75 ASTM standards prepared by Committee D-9, including 56 test methods, 16 specifications, two recommended practices, and a list of definitions.

"Consulting Service." 14th Edition. Association of Consulting Chemists & Chemical Engineers, Inc., New York, N. Y. 144 pages. The specialized activities, qualifications, laboratory equipment, and complete addresses of members of the organization are given in this silver anniversary issue.

"Scientific Analysis of Flavor and Odor." Evans Research & Development Corp., New York, N. Y. 6 pages. The scientific analysis of flavor and odor by panel testing, as it is applied to various fields, including rubber and plastics, is described in this brochure.

"The Journal of the Rubber Research Institute of Malaya: Determination of Available Nutrients in Malayan Soils." G. Owen. Vol. 14, Communication 282. Rubber Research Institute of Malaya, Kuala Lumpur, Malaya. 12 pages. A comparison of different methods of estimating available potash and phosphate in Malayan soils is contained in this publication.

"Titeflex Helically-Wound Flexible Metal Tubing; Uniflex Helically-Corrugated Flexible Metal Tubing." Catalog No. 200. Titeflex, Inc., Newark, N. J. 52 pages. The construction, specifications, fittings and assemblies, and engineering data covering these two types of metal hose are contained in this illustrated booklet. Featured in the publication are charts on frictional losses *versus* flow rates in flexible hose.

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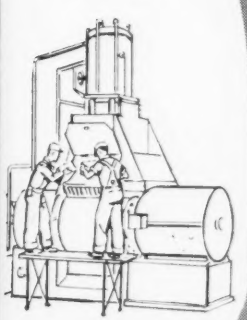

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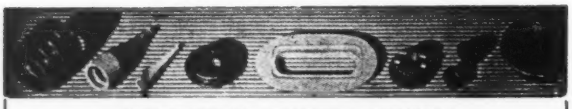

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(Classified Advertisements Continued on Page 549)

MARKET REVIEWS

RUBBER

A MODERATE price decline in both rubber spot and futures prices took place during the period from May 16 to June 15. In general, trading was sporadic, and the general tone was quiet in both markets. Prospects for a truce in Korea acted as the primary cause for the price decreases, but the markets displayed a marked disposition by importers and dealers to await further developments in the GR-S plant disposal program.

Offerings in the spot market were plentiful and at prices generally attractive, but most purchases appeared to be of the fill-in type and usually limited to the lower grades. Most of the activity in the futures market consisted of switching operations. On June 11 the Commodity Exchange suspended trading in the #3 Contract, which had shown virtually no activity since its inception on December 9, 1952.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	Mar. 28	Apr. 25	May 23	May 30	June 6	June 13
R. S. S., #1	26.25	25.13	25.88	25.38	25.00	25.13
2	25.50	24.38	25.13	24.63	24.25	24.38
3	24.25	23.13	23.88	23.38	23.00	23.13
Latex Crepe						
#1 Thick	30.75	28.25	28.63	28.25	27.88	28.00
Thin	30.50	28.00	28.38	28.00	27.63	27.75
#3 Amber Blankets	24.00	22.75	23.25	22.88	22.63	22.00
Thin Brown Crepe	23.00	21.88	22.25	22.00	21.75	21.75
Flat Bark	21.38	20.00	20.88	20.38	20.00	20.13

The spot price for #1 Ribbed Smoked Sheets started the period at 25.50¢, rose to a high of 26.13¢ on May 20, fell steadily to a low of 25.00¢ on June 5-8, and then recovered to end the period at 25.13¢. The May monthly average spot prices for certain grades were as follows: #1 R.S.S., 25.99¢; #3 R.S.S., 23.99¢; #3 Amber Blankets, 23.28¢; and Flat Bark, 20.90¢.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

	Mar. 28	Apr. 25	May 23	May 30	June 6	June 13
Futures						
Sept.	25.20	24.15	24.60	24.40	24.00	24.35
Dec.	24.90	23.75	24.25	24.10	23.75	24.00
Mar.	24.65	23.65	24.05	23.85	23.60	23.85
May	24.40	23.55	23.85	23.70	23.45	23.70
July	----	----	23.75	23.60	23.35	23.60
Total weekly sales, tons	1,340	2,280	720	940	1,110	3,220

September futures began the period at 24.60¢, rose to a high of 25.00¢ on May 20, fell to a low of 24.00¢ on June 5-8, and closed at 24.25¢ on June 15. The sales volume in the standard #1 Contract during the latter half of May amounted to only 1,660 tons, making a total for the month of 5,930 tons. There were no sales in the #3 Contract during the second half of May, and the monthly total was only 40 tons. During the first half of June, 4,370 tons were sold in the #1 Contract. There were no sales during June in the #3 Contract.

The Office of Synthetic Rubber, RFC, has announced the following price list for GR-S oil masterbatch polymers, effective June 16:

	Price per Lb., ¢
Oil Masterbatches	
GR-S 1703	$19.50
1704, 1705, 1706	19.25
1707, 1708	18.00
1709, 1710, 1711, 1712	17.75
Oil-Black Masterbatch	
GR-S 1801	16.75

Latex

NO CHANGE in the tight supply position for *Hevea* latex occurred during the period from May 16 to June 15. While not so acute as a few months ago, the shortage is not expected to be alleviated materially until July. Increased supplies becoming available at that time, together with the seasonal summer decline in consumption and indications that demand from the automotive and textile industries may fall off, should provide opportunity for the building up of domestic stocks.

Spot and nearby *Hevea* bulk latex prices during the period ranged from 37-39¢ per pound, dry solids, although supplies were virtually non-existent. Some resales of spot latex were said to have been made at a price of 40¢ per pound solids. Latex for July-September delivery was priced at 34-36¢ per pound solids; while long-term commitments for the fourth quarter were reported to have been made at 32½¢ per pound solids.

Supplies of cold GR-S latex continued short, but may ease in the fall if sufficient natural latex stocks are available at attractive prices. Final March and preliminary April domestic statistics on *Hevea* and synthetic rubber latices are given in the following table:

(All Figures in Long Tons, Dry Weight)

	Production	Imports	Consumption	Month-End Stocks
Natural latex				
March	0	6,671	6,317	6,738
April*	0	6,200	6,048	7,508
GR-S latices				
March	3,993	245	4,502	4,804
April*	4,261	216	4,387	4,884
Neoprene latex				
March	728	0	739	1,075
April*	879	0	749	1,224
Nitrile latices				
March	407	0	359	880
April*	429	0	361	840

*Preliminary.

RECLAIMED RUBBER

THERE were no major developments in the reclaimed rubber market picture during the period from May 16 to June 15. Sales of reclaim in June are expected to continue at good levels, although down somewhat from the May figures.

The outlook for reclaim usage in replacement tires is expected to be good throughout the summer, although the predicted cutback in automobile production should result in a decreased demand for reclaim in auto mat production. Two of the problems facing the reclaiming industry are the need of non-staining reclaims for use in colored auto floor mats and the need of an improved quality reclaim with greater impact strength for use in battery containers to help meet competition from GR-S. There is reason to believe that both problems will be solved successfully.

Demand from the mechanical goods industry has shifted somewhat to high tensile products; this shift means a smaller consumption of reclaim in these items. In general, reclaim encounters its toughest competition in non-transportation items. To meet this situation it will be necessary for reclaimers to develop new products and applications.

Final March and preliminary April statistics on the domestic reclaimed rubber industry are now available. March figures, in long tons, are: production, 27,699; imports, 265; consumption, 27,334; exports, 1,115; and month-end stocks, 30,280. Preliminary figures for April, in long tons, are: production, 28,589; imports, 238; consumption, 26,527; exports, 1,033; and month-end stocks, 30,834.

Reclaimed Rubber Prices

	Lb.
Whole tire: first line	$0.10
Fourth line	.0875
Inner tube: black	.15
Red	.2425
Butyl	.125
Pure gum, light colored	.2425
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

SCRAP RUBBER

LIMITED trading continued to characterize the scrap rubber market during the period from May 16 to June 15. Reclaimers made only small-scale purchases to meet their immediate needs, and there were no indications that any supplies were being taken for stockpiling purposes. A further slowdown in market activity is anticipated during the summer months as mills close down for vacation periods.

Declines in prices for No. 3 peelings and for red and butyl tubes took place during the period. Following are dealers' selling prices for scrap rubber, in carload lots, delivered to mills at the points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$12.00	$13.50
S. A. G. auto tires	Nom.	Nom.
Truck tires	Nom.	Nom.
Peelings, No. 1	40.00	40.00/42.00
2	Nom.	24.00
3	16.00/18.00	18.00
	(¢ per Lb.)	
Auto tubes, mixed	2.00	2.50
Black	3.25	3.50
Red	9.75	10.00/10.25
Butyl	1.75/2.00	2.25

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE
WEEK-END CLOSING PRICES

	Mar. 28	Apr. 25	May 23	May 30	June 6	June 13
Futures						
Oct.	33.55	33.54	33.81	33.77	33.78	33.88
Dec.	33.63	33.59	33.78	33.80	33.88	33.95
Mar.	33.75	33.71	33.83	33.84	33.93	34.04
May	33.74	33.70	33.83	33.82	33.90	34.02
July	33.47	33.48	33.50	33.60	33.68	33.76
Oct.	—	—	32.85	33.05	33.13	33.17

PRICES fluctuating in a narrow range, liquidation of old July, and moderate trading featured the cotton market on the New York Cotton Exchange during the period from May 16 to June 15. Indications that sizable selling orders were overhanging the market in the December, March, and May deliveries served to dampen any bullish tendencies. On

BUSINESS OPPORTUNITIES (Continued)

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CUSTOM MIXING

Surplus capacity available to customers' specifications on No. 3A Banbury Type Machine. We are manufacturers of Molded, Lathe Cut, and Extruded Soft Rubber Goods and have surplus mixing capacity.

MARTIN RUBBER COMPANY
Long Branch Ave., Long Branch, N. J.
Telephones: Long Branch 6-1221-1222

MACHINERY AND SUPPLIES FOR SALE

FOR SALE: FARREL 16" x 48" AND 15" x 36" 2-ROLL RUBBER Mills, and other sizes up to 84". Also new lab. 6" x 12" & 6" x 16" Mixing Mills and Calenders. Extruders, 1" to 6". Baker-Perkins Mixers 100, 50, and 9 gals., heavy-duty double-arm. 350-ton upstroke Hydr. Press, 22" x 24" platens. Brunswick 200-ton Hydraulic Presses 21" x 21" platens. Large stock of hydraulic presses from 12" x 12" to 48" x 48", platens from 50 to 2,000 tons. Hydraulic Pumps and Accumulators. Rotary Cutters. Stokes Automatic Molding Presses. Single punch & rotary Preform Machines. Banbury Mixers. Crushers, Churns, Rubber Bale Cutters, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT CO., 107 — 8th St., Brooklyn 15, N. Y. STerling 8-1944.

GOOD USED MACHINERY

WANTED: YOUR IDLE EQUIPMENT

1—6" x 12" Laboratory Mill, m.d.
2—Ball & Jewell #2 Rotary Cutters; 1—#1; 1, with 3 h.p. motor.
1—Farrel Birmingham 6" x 13" self-contained 3-roll Calender, m.d.
4—#28 Devine Vac. Shelf Dryers, 19-59" x 78" shelves, complete.
1—16" x 42" Rubber Mill, m.d.
4—Bolling 18" x 18", 5-opening Hydraulic Presses, 10" dia. ram.
1—6' x 24' Vulcanizer quick opening door.
1—Royle #4, 6" Extruder; 1—#1, with chrome plated screw, m.d.
1—Patterson S/S 110 gal. Vacuum Mixer, Sigma Blades.
1—B.P. 20 gal. Jacketed Mixer, Double Sigma Blades.
1—400-gal. closed jack. Nickel Kettle.

Also other sizes Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters.

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Two HPM "Turbojector" Horizontal Type Molding Presses

450 tons capacity. Steam heated platens, size 21½" x 28". Injection stock feed units. Complete with electrical equipment for operation on 220/440 volt, 3-phase, 60 cycles. Serial numbers 45-668 and 45-669.

$12,000 each "as is", f.o.b. from Wilmerding, Pennsylvania, plant. Will sell spare parts (including hydraulic pump) valued at $1,850 for $900. For appointment or further information, call S. H. Snee or F. L. Leffard, Westinghouse Air Brake Company, BRandywine 1-1490, Pittsburgh, Pennsylvania.

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Mills - Spreaders - Churns
Mixers - Hydraulic Presses
Calenders

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DUROMETER

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TECHNICAL DATA ON REQUEST

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MILLS, CALENDERS, TUBERS
VULCANIZERS, ACCUMULATORS

UNITED

HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS

UNITED RUBBER MACHINERY EXCHANGE
183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

(Classified Advertisements Continued on Page 551)

the other hand, proximity of prices to the new crop loan basis offered little incentive to press the selling side. As a result, many traders remained on the sidelines and awaited further developments.

The $^{15}/_{16}$-inch middling cotton spot price started the period at 34.50¢, rose to a high of 34.60¢ on May 19 and 20, fell back to a low of 33.85¢ on May 27 and 28, and then moved irregularly to end the period at 34.05¢. Futures prices fluctuated over even narrower ranges; October futures started at 33.85¢, fell to a low of 33.52¢ on May 27, reached a high of 33.88¢ on June 11 and 12, and closed the period at 33.70¢.

Fabrics

Limited trading in wide industrial fabrics for July delivery developed early in June. Demand came from the coating and the automobile industries, both of which appeared to be following a very cautious buying policy. Since many coating plants and mills will close down for one or two weeks in July, any general covering of needs for the third quarter cannot be expected until some time in July.

A little business was reported in wide sheetings for July and early August delivery, and some sales were made in sateens, twills, and drills for the same period. The pattern of trading in ducks was unchanged, although sales were reported only into July at current prices.

Cotton Fabrics

Drills			
59-inch 1.85-yd.	yd.	$0.38	
2.25-yd.	"	.34	.3325
Osnaburgs			
40-inch 2.11-yd.	yd.	.235	.2375
3.65-yd.	"	.155	
Ducks			
38-inch 1.78-yd. S. F.	yd.	.3875	
2.00-yd. D. F.	"	.31 /	.315
51.5-inch, 1.35-yd. S. F.	"	.51¾	
Hose and belting	"	.67	
Raincoat Fabrics			
Print cloth, 38½-inch, 64x60	yd.	.1525	.165
Sheeting, 48-inch, 4.17-yd.	"	.22	
52-inch, 3.85-yd.	"	.235	
Chafer Fabrics			
14.30-oz. sq. yd. Pl.	lb.	.73	
11.65-oz./sq. yd. S.	"	.65	
10.80-oz./sq. yd. S.	"	.6875	
8.9-oz. sq. yd. S.	"	.70	
Other Fabrics			
Headlining, 68-inch, 1.45-yd., 2-ply	yd.	.5725	
64-inch, 1.25-yd., 2-ply	"	.63 /	.6325
Sateens, 53-inch, 1.32-yd.	"	.575	
58-inch, 1.21-yd.	"	.6275	.63
Tire Cords			
K. P. std., 12.4.2	lb.	nom.	

RAYON

SHIPMENTS of rayon by domestic producers during May totaled 108,900,000 pounds, an increase of 5,200,000 pounds over the preceding month's figure. Of this total, yarn shipments amounted to 82,190,000 pounds, or 3,000,000 pounds over the April figure. Calculated production of viscose high-tenacity yarn during May was 40,400,000 pounds, or 97% of rated capacity, as compared with 39,700,000 pounds, or 99%, respectively, in April. Total shipments of high-tenacity yarn during May reached 40,100,000 pounds, an increase of only 100,000 pounds over those of the previous month, and month-end stocks were 5,400,000 pounds.

No changes were made in rayon tire yarn and fabric prices during the period from May 16 to June 15, and current prices follow:

Rayon Prices

Tire Yarns	
1100/480	$0.63
1100/490	.62
1150/490	.62
1650/720	$0.61 / .62
1650/980	.61
1900/980	.61
2200/960	.60
2200/980	.60
4400/2934	.63
Tire Fabrics	
1100/490/2	.72
1650/980/2	$0.659 / .73
2200/980/2	.685

Estimated Automotive Pneumatic Casings and Tubes, Shipments, Production, Inventory, April, March, 1953; First Four Months, 1953, 1952

	April, 1953	% of Change from Preceding Month	March, 1953	First Four Months, 1953	First Four Months, 1952
Passenger Casings					
Shipments					
Original equipment	3,289,979		3,039,179	11,656,467	7,772,843
Replacement	4,264,652		3,793,323	15,134,505	12,871,835
Export	44,752		41,494	147,598	202,981
Total	7,599,383	+10.55	6,873,996	26,938,570	20,847,659
Production	7,832,741	−1.09	7,918,828	29,423,064	24,421,017
Inventory end of month	13,665,786	+2.26	13,364,132	13,665,786	10,584,603
Truck and Bus Casings					
Shipments					
Original equipment	507,775		530,874	1,978,006	1,949,225
Replacement	735,859		804,824	3,153,292	2,658,646
Export	70,188		45,832	223,719	360,452
Total	1,313,822	−4.90	1,381,530	5,355,017	4,968,323
Production	1,429,390	−3.92	1,487,707	5,720,042	5,880,988
Inventory end of month	3,206,643	+3.72	3,091,734	3,206,643	2,710,788
Total Automotive Casings					
Shipments					
Original equipment	3,797,754		3,570,053	13,634,473	9,722,068
Replacement	5,000,511		4,598,147	18,287,797	15,530,481
Export	114,940		87,326	371,317	563,433
Total	8,913,205	−7.97	8,255,526	32,293,587	25,815,982
Production	9,262,131	−1.54	9,406,535	35,143,106	30,302,005
Inventory end of month	16,872,429	+2.53	16,455,866	16,872,429	13,295,391
Passenger, Motorcycle, Truck and Bus Inner Tubes					
Shipments					
Original equipment	3,796,819		3,570,595	13,640,964	9,697,122
Replacement	2,904,738		2,940,286	13,373,313	10,721,030
Export	67,087		44,422	211,174	395,578
Total	6,768,644	−3.25	6,555,303	27,225,451	20,813,730
Production	7,544,244	+1.00	7,469,623	27,571,652	21,719,582
Inventory end of month	12,154,854	+8.12	11,241,817	12,154,854	11,012,722

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

Compounding Ingredients - Price Changes and Additions

Accelerators, Organic

V-32	lb.	$0.66	$0.80
A-100	lb.	.52	.66
Accelerator 49	lb.	.53	.54
Altax	lb.	.48	.505
Arazate	lb.	.2.25	
Beutene	lb.	.66	.71
Butasan	lb.	1.04	
Butazate	lb.	1.04	
Butyl Zimate	lb.	1.04	
Captax	lb.	.38 /	.40
DOTG	lb.	.54	.58
DPG	lb.	.48	.55
El-Sixty	lb.	.50	.57
Ethasan	lb.	1.04	
Ethazate	lb.	1.04	
Ethyl Thiurad	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04	
Zimate	lb.	1.04	
Hepteen	lb.	.44 /	.50
Base	lb.	1.85	
Ledate	lb.	1.04	
M-B-T	lb.	.35	.43
—XXX	lb.	.49	.51
MBTS	lb.	.435	.53
—W	lb.	.53	.55
Mertax	lb.	$0.49	$0.56
Methasan	lb.	1.04	
Methazate	lb.	1.04	
Methyl Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14	
Mono-Thiurad	lb.	1.14	
Mortex	lb.	.65	.70
NOBS No. 1	lb.	.69	.71
O-X-A-F	lb.	.49	.54
Pentex	lb.	1.04	
Flour	lb.	.21	
Pip-Pip	lb.	2.07	
R-2 Crystals	lb.	2.45	
Rotax	lb.	.49	.51
RZ-50, —50B	lb.	1.00	
Santocure	lb.	.69 /	.76
Selenac	lb.	2.50	
Thiocarbanilide (A-1)	lb.	.50	.57
Thiotide	lb.	.48	.55
S	lb.	.51	.58
Thiotax	lb.	.38	.45
Thiurad	lb.	1.14	
Trimene	lb.	.56	.62
Base	lb.	1.03	1.10
Tuads	lb.	1.14	
Tuex	lb.	1.14	
Unads	lb.	1.14	
Zetax	lb.	.49	.51
Zimate	lb.	1.04	

Accelerator-Activators, Inorganic

Litharge, Eagle	lb.	.1625	.1635
Red lead, Eagle	lb.	.1725	
White lead, basic Eagle, National Lead	lb.	.16	.17
White lead silicate Eagle	lb.	.17	.1875
National Lead	lb.	.1525	.1625

Accelerator-Activators, Organic

Emersol 110	lb.	.105 /	.1175
120	lb.	.11 /	.1225
130	lb.	.1325	.145
210 Elaine	lb.	.1025 /	.1325
Energy 600	lb.	.1025 /	.1325
Guantal	lb.	.57 /	.64
Vulklor	lb.	.75	.95

Antioxidants

AgeRite Alba	lb.	.2.35 /	2.45
Gel	lb.	.64 /	.66
H. P.	lb.	.72 /	.74
Hipar	lb.	.98 /	1.00
Powder	lb.	.52 /	.54
Resin	lb.	.75 /	.77
D	lb.	.52 /	.54
Aminox	lb.	.52 /	.57
Betanox Special	lb.	.80 /	.85
B-L-E, —25	lb.	.52 /	.57
B-X-A	lb.	.52 /	.57
Flectol H	lb.	.52 /	.59
Flexamine	lb.	.72 /	.77
Octamine	lb.	.52	.57

(Continued on page 552)

MACHINERY AND SUPPLIES FOR SALE (Continued)

STOKES ROTARY PELLET PRESSES — RD-3 AND RDS-3; KUX Model 25; Ball & Jewell Stainless Steel Rotary Cutter #1½; Mikro Pulverizers #1-SH, #1-SI, #2-TH, #2-SI, #2-DH. Large stock steel and stainless steel tanks and kettles. PERRY EQUIPMENT CORP., 1424 N. 6th St., Philadelphia 22, Pa.

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WANTED: RUBBER MACHINERY INCLUDING BANBURY Mixers, Heavy-Duty Mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a now-operating or shut-down plant. P. O. Box 1351, Church Street Sta., New York 8, N. Y.

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1—Ambaco Model 3A Continuous Baler.
1—Stewart Bolling 2-roll Lab. Mill 6" x 12".
1—Thropp 2-roll Rubber Mill 10"x24".
2—Thropp 2-roll Rubber Mills, 18"x50".
1—Thropp 2-roll Rubber Mill 14" x 30".
1—Adamson Vulcanizer, 2' x 12' with quick opening door.
1—Ball & Jewell Stainless Steel #0 Rotary Cutter with Motor.
1—Paul O. Abbe #2 Master Rotary Cutter with Ball Bearings.
1—Welding Engr. Stainless Steel #2 Extruder.
1—Sprout Waldron Attrition Mill, Type 36 with 2 — 75 HP Motors.

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1-23 JABEZ ST., NEWARK 5, N. J.
TEL. HUMBOLDT 2-8000
40 YEARS EXPERIENCE

U. S. Imports, Exports and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	February, 1953	
	Quantity	Value
UNMANUFACTURED, LBS.*		
Crude rubber	94,339,745	$24,336,087
Latex	14,198,901	4,480,115
Jelutong or Pontianak	269,351	182,792
Balata	236,123	67,665
Gutta percha	46,775	32,473
Crude chicle	601,859	452,893
Synthetic rubber	2,777,045	†31,729
Reclaimed rubber	470,916	27,207
Scrap rubber	2,256,786	78,595
TOTALS	115,197,501	$30,389,556
MANUFACTURED		
Rubber tires		
Auto, etc. *no.*	4,907	$284,809
Bicycles *no.*	3,804	6,289
Other *no.*	3	2
Inner tubes		
Auto, etc. *no.*	226	678
Footwear		
Boots *prs.*	8,590	29,400
Shoes and overshoes *prs.*	33,446	22,167
Rubber-soled canvas shoes *prs.*	5,466	2,203
Athletic balls		
Golf *no.*	27,432	7,919
Tennis *no.*	44,784	10,727
Other *no.*	38,496	3,535
Toys		29,778
Hard rubber goods		
Combs *no.*	8,804	774
Drug sundries		211
Other		30,581
Rubberized printing blankets *lbs.*	1,562	3,358
Rubber and cotton packing *lbs.*	5,411	8,724
Gaskets and valve packing		1,469
Molded insulators		3,962
Belting *lbs.*	1,337	2,507
Hose and tubing		11,529
Gloves *prs.*	22,320	3,304
Nipples and pacifiers *gr.*	3,700	5,332
Instruments *doz.*	2,064	6,679
Heels and soles *lbs.*	3,689	3,276
Bands *lbs.*	2,818	1,975
Other		984
Gutta percha manufactures *lbs.*	2,126	1,323
Synthetic rubber products		9,828
Other soft rubber goods		106,110
TOTALS		$599,433
GRAND TOTALS, ALL RUBBER IMPORTS		$30,988,989

Exports of Domestic Merchandise

	February, 1953	
	Quantity	Value
UNMANUFACTURED, LBS.		
Chicle and chewing gum bases	464,996	$209,689
Balata, gutta percha, etc.	850	2,175
Synthetic rubbers		
GR-S type	1,000,899	256,877
Butyl	256,206	57,953
Neoprene	1,267,271	497,561
Nitrile type	277,870	138,038
Other	28,623	15,084
Reclaimed rubber	2,127,516	191,945
Scrap rubber	3,409,304	91,726
TOTALS	8,833,535	$1,461,048
MANUFACTURED		
Rubber cement *gals.*	75,759	177,378
And rubberized fabric *sq. yds.*	171,390	161,851
Clothing		109,577
Footwear		
Boots and shoes *prs.*	24,100	72,428
Rubber-soled canvas shoes *prs.*	22,402	41,171
Heels *doz. prs.*	68,069	84,461
Soles, soling, topliff sheets *lbs.*	1,505,016	357,334
Gloves and mittens *doz. prs.*	15,270	65,081
Drug sundries		167,348
Toys, balls, novelties		39,135
Hard rubber goods		
Battery boxes *no.*	38,853	75,178
Other electrical goods *lbs.*	147,567	110,866
Other		17,305
Rubber tires and casings		
Truck and bus *no.*	77,795	4,644,831
Auto and motorcycle *no.*	42,959	519,875
Aircraft *no.*	1,298	94,081
Off-the-road *no.*	7,825	854,355
Farm tractor *no.*	3,551	114,519
Implement *no.*	3,649	53,556
Other *no.*	9,931	95,438
Inner tubes		
Auto *no.*	20,172	39,109
Truck and bus *no.*	28,819	126,779
Aircraft *no.*	1,066	12,294
Other *no.*	14,764	80,153
Solid tires		
Truck and commercial *no.*	3,220	20,353
Other *lbs.*	1,069	108
Tire repair material		
Camelback *lbs.*	1,087,367	316,711
Other *lbs.*	294,105	199,061
Tape, except medical and friction *lbs*	41,037	32,524
Belting		
V-type *lbs.*	84,002	141,768
Transmission V-type *lbs.*	103,283	219,087
Flat belts *lbs.*	81,684	98,438
Conveyor and elevator *lbs.*	179,799	144,681
Other *lbs.*	2,310	3,747
Hose		
Molded and braided *lbs.*	304,090	255,468
Wrapped and hand built *lbs.*	154,953	124,508
Other hose and tubing *lbs.*	142,501	167,971
Packing		
Sheet type *lbs.*	44,433	29,019
Other *lbs.*	140,421	175,750
Tiling and flooring *lbs*	206,344	54,246
Mats and matting *lbs.*	379,676	114,804
Thread		
Bare *lbs.*	8,899	21,004
Textile covered *lbs.*	15,043	41,987
Compounded rubber for further manufacture *lbs.*	403,751	167,251
Other rubber manufactures		622,072
TOTALS		$11,064,661
GRAND TOTALS, ALL RUBBER EXPORTS		$12,525,709

SOURCE: Bureau of the Census, United States Department of Commerce, Washington, D. C.

Reexports of Foreign Merchandise

	February, 1953	
	Quantity	Value
UNMANUFACTURED, LBS.		
Crude rubber	2,197,024	$663,761
Balata, gutta percha, etc.	561	252
Synthetic rubber: GR-S type	25,736	13,154
TOTALS	2,223,321	$677,167
MANUFACTURED		
Rubber toys, balls, novelties		$ 114
Drug sundries		111
And rubberized fabric *sq. yds.*	720	735
Casings: farm tractor *no.*	52	2,549
Hose: molded and braided *lbs.*	100	133
TOTALS		$3,642
GRAND TOTALS, ALL RUBBER REEXPORTS		$680,809

United States Rubber Statistics—March, 1953

(All Figures in Long Tons, Dry Weight)

	New Supply			Distribution		Month-End Stocks
	Production	Imports	Total	Consumption	Exports	
Natural rubber, total	0	50,115	50,115	44,290	605	91,889
Latex, total	0	6,671	6,671	6,317	0	6,738
Rubber and latex, total	0	56,786	56,786	50,707	605	98,627
Synthetic rubbers, total	*73,679 †7,729	1,542	82,950	77,903	1,691	116,089
GR-S types‡	*66,253 †37	1,395	67,685	62,691	548	84,013
Butyl	*7,426	147	7,573	7,913	0	19,581
Neoprene‡	†6,220	0	6,220	5,850	930	8,738
Nitrile types‡	†1,472	0	1,472	1,449	213	3,757
Natural rubber and latex, and synthetic rubbers, total	81,408	58,328	139,736	128,610	2,296	214,716
Reclaimed rubber, total	27,699	265	27,964	27,334	1,115	30,280
GRAND TOTALS	109,107	58,593	167,700	155,944	3,411	244,996

*Government plant production.
†Private plant production.
‡Includes latices.
SOURCE: Rubber Division, NPA, United States Department of Commerce, Washington, D. C.

Compounding Ingredients

(*Continued from page 550*)

Polygard	*lb.*	$0.52	$0.57
Rio Resin	*lb.*	.60	.62
Santoflex 35	*lb.*	.72	.79
AW	*lb.*	.78	.85
B	*lb.*	.52	.59
BX	*lb.*	.63	.70
Santowhite L	*lb.*	.52	.59
Spar	*lb.*	.52	.54
Stalite	*lb.*	.52	.54
Sunproof 713	*lb.*	.25	.30
Improved	*lb.*	.25	.30
Jr.	*lb.*	.20	.25
Tonox	*lb.*	.52	.57
V-G-B	*lb.*	.70	.75
Blowing Agents			
Celogen 50-C	*lb.*	1.01	1.07
Carbon Blacks			
(SAF) Philblack I	*lb.*	.11	.15
(SRF) Furnex	*lb.*	.045	.085
Chemical Stabilizers			
Eagle Basic Silicate White			
Lead 201	*lb.*	.1775	.1875
202	*lb.*	.17	.18
Vanstay HT	*lb.*	.90	.92
HTR	*lb.*	1.20	1.22
S	*lb.*	.65	.70
Colors, White			
Zinc oxide			
Azo 35% leaded	*lb.*	.1425	.1525
50% leaded	*lb.*	.143/4	.153/4
Eagle, 35% leaded	*lb.*	.1425	.1525
50% leaded	*lb.*	.143/4	.153/4
Lehigh, 35% leaded	*lb.*	.1425	.1525
50% leaded	*lb.*	.143/4	.153/4
Latex Compounding Ingredients			
Aquablaks	*lb.*	.085	.1775
Colors, Other Than White			
Covinylblaks	*lb.*	.68	1.145
Mapico Black	*lb.*	.1275	.13
Brown	*lb.*	.1375	.205
Red	*lb.*	.1275	.13
Yellow	*lb.*	.105	.1075
Plasticizers and Softeners			
Harflex 500	*lb.*	.34	.3675
Pepton 22	*lb.*	.79	.82
Pigmentar, American	*lb.*	.041	.0678
Sunny South	*lb.*	.0389	.0678
Pigmentaroil, American	*lb.*	.041	.0678
Sunny South	*lb.*	.0394	.0678
Pitch, Burgundy, Sunny South	*lb.*	.098	.1025
Reclaiming Oils			
BWH-1	*lb.*	.16	.18
Reinforcers, Other Than Carbon Black			
Kralac A-EP	*lb.*	.43	.54
Vulcanizing Agents			
Dibenzo G-M-F	*lb.*	2.60	
G-M-F #113	*lb.*	.90	
G-M-F	*lb.*	2.60	
#117	*lb.*	.90	
Vandex	*lb.*	4.75	

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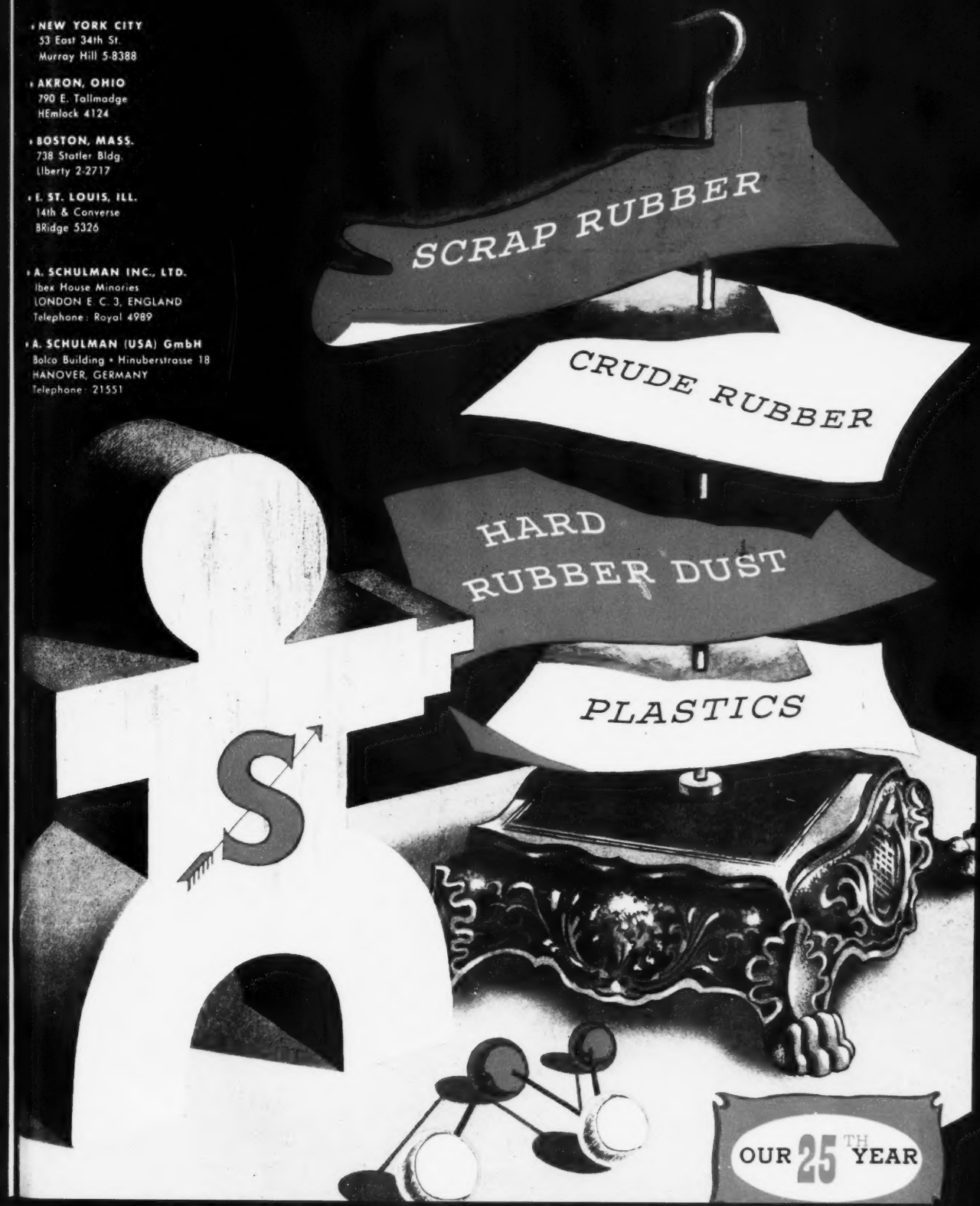

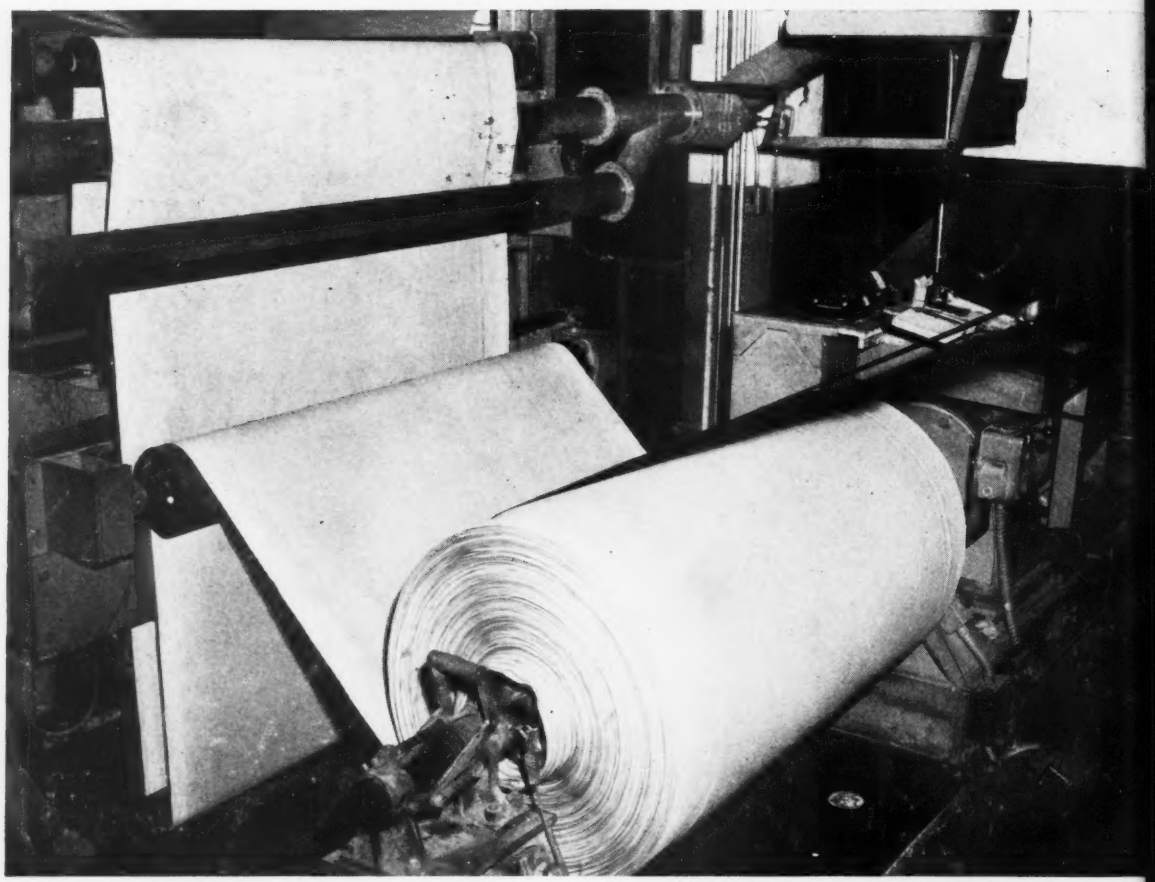

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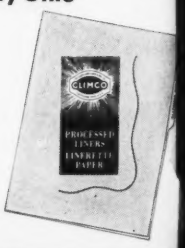

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